Preface

Proceedings of the 24th UK Academy for Information Systems (UKAIS) International Conference
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On behalf of the UKAIS and its committee, we welcome you to the conference proceedings for UKAIS 2019. This volume contains the papers presented at UKAIS2019: UK Academy for Information Systems, Annual International Conference 2019 held on April 09-10, 2019 at St Catherine’s College in Oxford, UK. There were 57 submissions. Each submission was reviewed by at least 1 reviewer, and the programme committee decided to accept 49 papers. The program also includes 2 Keynote presentations - Laura Edwards, Commercial Director, Viral Talent and Keith Dewhurst, Director of TVS Supply Chain Solutions.

The UKAIS conference is the premier academic event in the Information Systems calendar within the UK, and attracts leading scholars from the UK and overseas. It is a charity, whose aims are to enhance the recognition and knowledge of IS within the UK, and to provide a forum for discussing issues in IS teaching and research. UKAIS recognises the importance of including practitioners in its work.

The UK Academy for Information Systems was established in 1994 to foster a better understanding of the Information Systems field within the UK. We provide a forum for discussing issues in IS teaching and research and lobby professional/policy bodies on behalf of our field, such as the Office for Students, UKRI/Research England, UK business and UK Government. There is a conference every year, normally held in Oxford, which is preceded by a PhD consortium.

UKAIS Aims:

• To promote a better knowledge and understanding of information systems within the United Kingdom.

• To improve the practice of information systems teaching and research.

• To enable successful knowledge transfer of IS research into teaching and practice in order to provide a positive economic and societal impact.

Many thanks to all those that have given of their time so freely to review papers for the academy, it is much appreciated. Also a huge thanks to our conference administrators, Abi Hopkins and Emma Pearson, who really do keep all in check and on track and make the conference happen.

This year we have received some sponsorship from the MDPI journal ’Informatics’, which we gratefully acknowledge: Informatics (ISSN 2227-9709) is an international, peer-reviewed, open access journal, which publishes original theoretical and empirical work on the science of informatics and its application in multiple fields. Our concept of Informatics includes technologies of information and communication as well as the biological, social, linguistic and cultural changes that initiate, accompany and complicate their development.

Finally thanks to EasyChair who have supported the collection and review of papers, as well as the collation of papers into this volume for the proceedings.

We hope you enjoy the conference and all the many intense and academic discussions that will happen over the two days of the conference.

April, 2019

Oxford

The UKAIS national committee
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Interpreting Rich Pictures using Content Analysis

Abstract:
Rich pictures have roots in soft systems and are widely used by practitioners to understand complex problems from many stakeholder viewpoints. This study uses rich pictures as a tool for collaborative drawing to explore international student experience in Scotland. Historically rich pictures are difficult to interpret and are often used to gain a holistic understanding of a system of concern and thus are disregarded in terms of providing in-depth qualitative data. We will explore the use of inter-coder content analysis to gain a deep understanding of group thinking. In the context of this study, using content analysis, our findings revealed a detailed understanding of Scottish culture and traditions from the perspective of international students. We determine that visuals have a vast capacity to communicate, irrespective of possible language, culture and education barriers, and thus offer unique insight into a complex system of stakeholder understanding.

Key words: Rich Picture, Content analysis, Soft Systems

Introduction: Developing perspectives through Rich Pictures
The rich picture (RP) is a familiar method used in soft systems to gather understanding about human activity for system design. The soft system approach came about due to the realisation that not all problems are clear cut and are sometimes, “ill structured and messy” (Khisty, 1993). Peter Checkland and his team in Lancaster developed the Soft System Methodology (SSM) as a way of analysing complex problem situations (Checkland, 1981). SSM can be defined as a socio-technical system methodology offering tools for analysing complex situations. This modelling approach identifies differing worldviews of the system by encouraging discussion and debate initially through a tool called the RP. The RP has been applied in many different fields, both in academia and in practice and is seen to originate from Checklands work in the mid-70s on Soft Systems. The RP lies at the heart of Checklands human activity system illustrating how people are involved in the system. There does seem to be a division in academia (Bronte-Stewart, 1999) on what the RP is. Whilst some suggest the RP is a process others advocate it is a tool and for some it is seen as a technique, method, expression or a devise.

The RP assists the exploration of different world views within a complex situation. The RP is a physical picture drawn by a variety of hands which encourages discussion and debate for groups and allows them to arrive at an agreed understanding. This makes it a powerful device in participatory processes. RPs consist of a set of entities we call icons (Bell et al, 2016). Icons can represent objects or processes such as action or emotion. The RP is not rule bound in facilitation, form or content and creators are encouraged to add their own subjective interpretation to the picture. The RP expresses, via a symbolic language, and aids group understanding by initiating problem investigation in a permissive environment. RPs have the capability to recreate in the present what has happened in the past and represent the now whilst offering insight into the future. The RP can add extra dimension and a level of truthful tacit understanding that might not be available through other methods of group investigation. The collaboratively drawn RP offers a group consensus rather than an individual opinion. Academic literature is replete with examples of the RP being used in situations away from its roots in system design from nursing (Ballard, 2007), social care (Fougner & Habib, 2008), internet
security (Just & Berg, 2017), construction (Mazijoglou & Scrivener, 1998), creativity (Proctor, 1995) landscape visualisation (Boedhihartono, 2012) and engineering (Sutrisna & Barrett, 2007) to name just a few of the instances where they emerge.

The RP is the outcome of an analytical process by a group of people. The RP thus reflects thoughts, feelings and beliefs that are present at the time of drawing. It might not capture all the discussion that the group had and does not explain why things may have been included or left out. To date, RPs have been seen mainly as an enquiry or discussion aiding device and its real usefulness expires after completion. However, we know from previous research (Berg, 2013) there are narrative stories with unique iconography in RPs. But we wish to go further than that and propose the idea that RPs can be analysed so as to tell us something about the thoughts of those that make them. We believe the RP that could tell us a lot about the dynamics and mind-set of those composing the RP. The RP is so much more than a series of process, structure and relationship outputs and therefore, to interpret both soft and hard facts, an appraisal method need to be holistic as well as deconstructionist. By this we mean, it is only possible to understand certain formal information when taking the RP apart. However, looking at the whole picture gives a more comprehensive view which can highlight the more subtle, soft or tacit messages or nuances.

*Please note that the purpose of this paper is to highlight the use of content analysis for interpreting rich pictures. The study, as discussed in the following section, is our vehicle to show readers an interpretation process and thus the study topic is less important here than the methods used. The complete and detailed findings of this study have been written up and are under review in the International Journal of Higher Education Research.

Study: Using Rich Pictures to understand international student transition.

In this study we were investigating international student transition in Scotland. For many students, the move from study or work in their home country into higher education in another country is a major life change involving adjustment to their geographical, financial and social circumstances. This transition has the potential to cause great concern and stress with many having difficulties with language barriers and social interaction whilst for others the challenge is to understand and integrate into a new culture.

International students are an important revenue stream for universities across the world. A report by the Higher Education Statistics Agency (HESA, 2016) stated that in 2010 Universities generated £37 million from tuition fees in comparison to now more recently whereby figures show money generated by fees from international students and those from the Rest of the UK (RUK Students) is now in excess of £94 million. Recent HESA research revealed that in the past year there has been an increase of two per cent more Chinese students, three per cent more American students and eight per cent more Malaysian students studying in Scotland. Knight’s (2004, p25) early and often quoted definition of internationalisation as ‘the process of integrating an international, intercultural or global dimension into the purpose, functions or delivery of post-secondary education’ has become universally accepted. However, Yemini, (2015) argues that concept of internationalisation needs further definition in order to avoid the negative implications linked to neoliberalism due to the incorrect interpretation of its meaning by higher education institutions. The scope of internationalisation now seems to be concerned with maintaining and developing a cultural and education identity of the local campus environment whilst attempting to be inclusive to newcomers from abroad, opening up new
learning, teaching and research opportunities with a global ‘perspective’ (Berg & Guion Akdağ, 2016).

**Research Question:** What are the experiences, enjoyments and challenges of the international student community studying in a Scottish university? The objectives of this research are to have a deeper understanding of social, academic, economic, and cultural issues affecting international students studying in Scotland and a more nuanced understanding of the quality and commonality of relationships formed in cross-cultural encounters in Higher Education.

Three universities in Scotland were selected for the study as they presented a good institutional representation of central Scotland offering a wide selection of degree subjects to a diverse population of international students. Each university hosted RP workshops which were facilitated by the same facilitator every time. Appropriate ethical procedure and consent were applied throughout the project with all participants being anonymised. 71 international students placed within 16 groups across 5 workshops were asked to draw their experience of transition. The students came from a wide spectrum of countries with the five most common locations being China (42%), Europe (24%), Saudi Arabia (8 %), Malaysia (7 %) and USA (6 %). The student group we investigated consisted of international students studying either an Undergraduate, Postgraduate or PhD degree. Some of the students were on a year placement from their home institution whilst others were participating on a pre-sessional course prior to starting their post graduate degree.

At the beginning of the study we identified four key themes for investigation; social, academic, economic and cultural themes of studying in the UK experienced by international students. The four themes helped to provide a framework for identifying repeating elements (both pictorial and spoken) found in the RPs. It should be noted that many of the icons across all 16 RPs have been coded as having crossover themes and thus some icons fall within two, if not three, of the themes. This is discussed further in the methodology section below.

**Methodology**

**Recruitment:**

We recruited student participants by advertising extensively to the international student communities in 3 Scottish universities. We invited students to attend a rich picture workshops in February 2016 to discuss their experiences of being international students. An international student as defined in this study is a student whose home is outside of the UK, this includes European students and also students with English as first language from outside the UK. Participants registered directly on an online scheduling poll. Students who participated in the study were compensated for their time with an online shopping voucher.

**Workshop process:**

Students participated in one of the five, identically run, 4 stage workshops. Table 1 shows the stages of each workshop. In stage 1, the participants read a short project description and signed a consent form. They were sorted, by the facilitator, into small groups of 3/4/5; group size depending on workshop attendance. In stage 1 the facilitator gathered information on country of origin, and gender. In stage 2 the facilitator (same person for all 5 workshops) introduced the purpose of the workshop and presented the research question; what are the experiences, enjoyments and challenges of an international student community studying in a Scottish university? To stimulate input, we made a few suggestions on areas the groups might like to
consider such as academic expectations, home and social life, people that matter to you and plans for the future. Participants were asked to respond to the question by drawing their answers in pictures on a single large flip chart sized paper with a variety of coloured pens. Examples of previously drawn RPs, from an unrelated project, were shown to the groups to illustrate the lack of art skill required by the group.

<table>
<thead>
<tr>
<th>Stage and Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Consent and group formulation</td>
</tr>
<tr>
<td>2. Introduction</td>
</tr>
<tr>
<td>3. Rich picture drawing</td>
</tr>
<tr>
<td>4. Group explanations of the RP</td>
</tr>
</tbody>
</table>

Table 1 Workshop stages

In stage 3 each group drew their collaborative RP on the single sheet of large flip chart paper. An example of one of the group RPs from workshop 3 is seen in figure 1. It is worth noting that a RP is drawn by many hands accessing the paper from different angles thus, to read the picture, one must rotate the page. In stage 4 the facilitator asked all groups to gather beside their RP, which was hung on the wall beside them. Each group discussed what they drew and why. Stage 4 was facilitator lead with participants being encouraged to share their stories and expand upon their drawings with words. The discussions were audio recorded and later transcribed.

Figure 1: RP example from Workshop 1
Data Analysis

In total, five focus groups took place at three universities. Initially there were to be 3 workshops, one at each university, however small participant numbers at university 3 necessitated the need for further workshops.

<table>
<thead>
<tr>
<th>Institution</th>
<th>Workshop number</th>
<th>Numbers of Rich pictures drawn</th>
<th>Participant numbers</th>
<th>Gender split</th>
</tr>
</thead>
<tbody>
<tr>
<td>University 1</td>
<td>1</td>
<td>5</td>
<td>25</td>
<td>2 M/23 F</td>
</tr>
<tr>
<td>University 2</td>
<td>2</td>
<td>4</td>
<td>19</td>
<td>7 M/12 F</td>
</tr>
<tr>
<td>University 3</td>
<td>3</td>
<td>2</td>
<td>8</td>
<td>2 M/6 F</td>
</tr>
<tr>
<td>University 3</td>
<td>4</td>
<td>2</td>
<td>8</td>
<td>4 M/4 F</td>
</tr>
<tr>
<td>University 3</td>
<td>5</td>
<td>3</td>
<td>12</td>
<td>7 M/5 F</td>
</tr>
</tbody>
</table>

Table 2 RP workshops

In total, 16 RPs and the corresponding transcripts were analysed using content analysis (CA). CA is concerned with analysing the content of qualitative (non-numerical) in contrast to statistics which are characteristically applied in analysing quantitative (numerical) data. Bell et al (2016) propose that RPs can be analysed in order to tell us about the dynamics and mind-set of those composing the RP. Content analysis is widely used in the field of social science and this research proposes to explore through CA the similarities and differences within the RPs.

Five coders were employed to analyse the pictures and transcripts. The coders were final year students of the Information System programme in university 3 and they were all knowledgeable of the RP method. The coders firstly transcribed the stage 4 group discussions. They then individually assessed each picture for initial understanding and inter coder reliability (Lombard et al, 2002) before discussing with the other coding group members. The coders were given limited instruction and were encouraged to apply their own analysis system of coding to the pictures. They adopted a grounded theory approach (Glaser, 1967) with inductive content analysis (Lombard et al, 2002). Using colour coded stickers and a numbering system the coders analysed every RP in great detail. The transcripts from every group were coded, numbered and matched against the corresponding picture icons in the RPs. All RPs were coded using the same system with four core themes being identified as repeating common occurrences across all RPs.

The four themes are social, cultural, economic and academic. The coders identified within these themes as repetition fell broadly in these key areas. For example, when the coders saw icons relating to study, and education they coded these as academic and similarly if coders saw icons relating to meeting with friends then they coded as social. The coders determined that the theme cultural meant pictures that displayed icons such as local landmarks, traditional food, local laws and environment such as weather and nature in Scotland. The Economic theme was applied when the coders saw icons relating to money, expense and currency conversion rates. Coders also noted when an icon was displaying a negative or positive emotion. Emotion was often displayed through a facial image and thus simple to interpret when matched to the transcript.

It should be noted that many of the icons across all 16 RPs have been coded as having crossover themes and thus some icons fall within two of the themes. For an icon to be coded in a theme all 5 coders needed to be in agreement. If disagreement occurred, often by coding an ambiguous/ multi-dimensional icon, then the icon was either not coded or it was coded as a majority group assumption. For the purposes of this paper we will disregard all assumptions.

Table 3 provides a summary of the repeating icons where correlation of emotion was repeated;
for example, there were nine instances where an icon displaying weather was drawn and described as negative.

<table>
<thead>
<tr>
<th>Repeating icons</th>
<th>Repetitions out of the 16 RPs</th>
<th>Coded Theme</th>
<th>Correlation</th>
<th>Workshop &amp; Rich Picture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studying/High Workload</td>
<td>11</td>
<td>Academic</td>
<td>Negative 1a, 1b, 1c, 1d, 1e, 2b, 2c, 3a, 4a, 5b, 5c</td>
<td></td>
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<tr>
<td>Weather</td>
<td>9</td>
<td>Cultural</td>
<td>Negative 1a, 1c, 1d, 1e, 2b, 2c, 3a, 4a, 4b</td>
<td></td>
</tr>
<tr>
<td>Cooking/Food</td>
<td>9</td>
<td>Cultural/Social</td>
<td>Neutral 1a, 1b, 1c, 1d, 1e, 2b, 2c, 3a, 3b</td>
<td></td>
</tr>
<tr>
<td>Sight Seeing</td>
<td>8</td>
<td>Cultural</td>
<td>Positive 1a, 1b, 1c, 1d, 2a, 2b, 3a, 5c</td>
<td></td>
</tr>
<tr>
<td>Expensive Economy</td>
<td>7</td>
<td>Economic</td>
<td>Negative 1a, 1d, 1e, 2c, 2d, 3a, 4a</td>
<td></td>
</tr>
<tr>
<td>Missing friends and family</td>
<td>6</td>
<td>Social</td>
<td>Negative 1a, 1e, 2c, 2d, 5a, 5c.</td>
<td></td>
</tr>
<tr>
<td>Exercising</td>
<td>6</td>
<td>Cultural/Social</td>
<td>Neutral 1c, 1d, 1e, 2b, 2c, 2d</td>
<td></td>
</tr>
<tr>
<td>Nature</td>
<td>5</td>
<td>Cultural/Social</td>
<td>Neutral 2b, 2c, 2d, 3b, 5b</td>
<td></td>
</tr>
<tr>
<td>Socialising with Friends</td>
<td>5</td>
<td>Social</td>
<td>Positive 1b, 1c, 1e, 2a, 2c</td>
<td></td>
</tr>
<tr>
<td>Loneliness</td>
<td>4</td>
<td>Social</td>
<td>Negative 1a, 1d, 3a, 4a</td>
<td></td>
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<tr>
<td>Haggis</td>
<td>3</td>
<td>Cultural</td>
<td>Neutral 1a, 1c, 3a</td>
<td></td>
</tr>
<tr>
<td>Shopping</td>
<td>3</td>
<td>Cultural/Social</td>
<td>Neutral 1d, 1e, 3a</td>
<td></td>
</tr>
<tr>
<td>Balancing Studying</td>
<td>2</td>
<td>Academic</td>
<td>Negative 1b, 1e</td>
<td></td>
</tr>
</tbody>
</table>

Table 3 Icons Analysis

**Findings**

Through analysis of the RPs and cross coding with the corresponding transcripts the following icons emerged as prevalent within the pre-agreed framework themes; social, academic, cultural and academic. Across all 16 RPs the coders identified 465 icons within the four themes. Figures 2 and 3 provide the data in chart form. As previously stated the coders made agreed assumptions on many of the icons however this is not empirically proven data as there was no transcript discussion, during the drawing stage, to verify the exactness of meaning. In this paper we only focus and discuss the transcript confirmed icons ie the icons in which meaning is confirmed by the oral after picture group description.
In the following section examples are presented of the commonly drawn icons and the voiced statements within each theme. However, it should be noted that all four themes overlapped considerably, and many icons were coded across one or more of each theme. For example, a social theme might overlap with both culture and academic themes. The transcript codes show the workshop and RP of the conversations, for example ‘[w1,RPb]’ would be workshop one with picture b of that workshop.

*Note, due to constraints of publication it is not possible to provide examples of all 16 rich pictures referred to below however we can provide these to readers upon request. Where relevant we have provided examples of iconography of certain RPs.
Social Themes

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Figure 4

Coders classified the icons as ‘social’ when they depicted scenes of socialising, collaboration and communication or lack of such scenes. Group communication was commonly drawn depicting students enjoying social events (figure 4 B1). Sharing food was a common reoccurrence (table 3) however had mixed emotions attached to the action; “and sometimes we have party and cook a meal with my friends” [W1,RPa] whereas others showed negative examples of eating in isolation, “I live on campus, no one comes out and leaves their door open...my kitchen mates will make food and then hide in their rooms and eat it, it’s weird”. One to one communication had icons of telephone calls commonly depicting calls to family and friends back home however there were issues with time differences, “Eight hours’ time difference from Edinburgh to China, usually I cannot connect in the evening” [W1,RPd]. Isolation and loneliness was very apparent for international students (figure2, B2); “I miss my hometown so sometimes I feel lonely” [W2,RPb], “I miss my parents and my best friend [W5,RPc] and “Leaving your family, leaving your friends, and leaving them is not necessarily very easy” [W2,RPa] Many students had difficulty with socialising with home students, “I’ve found a lot of people here are really nice on a superficial level but it is difficult to form deeper friendships with people, they are quite reserved” [W2,RPa.] A common problem across many of the RPs was with the Scottish accent, “Another thing is the accent, I’m not very good at English so I must pay attention to the academic language and oral language, it is very difficult for me” [W2,RPb] and “The bus driver speaking to me in some weird language that I cannot understand”, [W3,RPb] “Scottish accent very strong” [W3,RPa]. For many the speed of speaking caused issues with understanding, “I found communication barriers and the first one I done is the speed of the speaking is just too fast for me” [W2,RPb]. Unfortunately for some the communication barrier hindered all communication, “I also have to come across question that how to express my thoughts in English, sometimes I just keep silent” [W1,RPb] However, for others, Scottish communication traits were voiced, “Scottish people in Edinburgh are like stand-off-ish, like it’s hard to approach somebody in class so you’re better talking to someone who looks Asian....its very lonely, I have no one to go to” [W3,RPa].

One students spoke of subconsciously mimicking the accent, “After drinking for several nights your accent turns into a Scottish one” [W2,RPd]. Alcohol related icons, specifically related to Scottish culture are further discussed in the cultural theme section. Some students noted the lack of night life in Scotland compared to what they are used to, “People here have no night
life because people are often focussed on staying in with family and are very keen for exercise” [W3,RPa], “Life here is quite boring….totally different than Asia” [W3,RPa]. In the social theme a repeated and negative (table 3), icon was one of loneliness and isolation (figure 1, bottom left), “I’m from China and I fly to Scotland, I always be alone, I cook alone, eat alone and go to school alone” [W1,RPd].

Academic Themes

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Figure 5

Many students discussed and drew icons regarding the benefits of being an international student, “British universities are really global so that’s what I like about them, you can meet more people from all around the world” [W3,RPb]. However, the icons associated with academic life and study were largely drawn as negative (table 3), there was strong emphasis on students being overworked, exhausted and highly concerned with assignments and exams (figure 5, A,B,C). Examples of text were, “I just wake up and spend a day and a whole night to workout my assignments, deadline is nearer, basically horrible academic life here” [W2,RPb] In figure 35 (1B) there is a professor being depicted as a devil shouting demands on the student. The corresponding transcript states, “the professor torture us” [W1,RPa]. Many of the students in this theme drew and discussed their concerns with fully understanding their teachers, “Culture shock, yes, when I listen to lecture speakers speaking sometimes I cannot catch up with his speed so I use a lot of time to think and to guess he or her meanings” [W2,RPb] however there was one student that offered a solution to this problem, “I’ve got a conclusion, if you don’t know what this is you should ask, so I want to be a good asker” [W2,RPb]. The balance between social and study was often depicted, “It is very hard for me to balance social life and academic life” [W1,RPb] with some students describing academic study using a mountain metaphor, “like a mountain climbing activity so we are always some point like ups and downs, sometimes at the peak, sometimes down the valley” [W1,RPc]. In one workshop a student complimented their university on the pastoral care service, “I like how there is a mentoring programme“[W3,RPa] while another in a different workshop noted issues regarding international exchange students, “There is no exchange group….there is no organised trips for exchange students, it’s not very good” [W2,RPc].
Economic Themes

All instances, both in icons and verbal descriptions, were coded as negative when discussing costs and exchange rates (table 3). Scotland was largely seen as expensive in particular with eating out, supermarkets and the exchange rates (figure 6). One student commented on the food at their university, “The food in university is quality but the price is quite expensive…... I bring my own food” [W3,RPa] whilst another discussed the price of fruit, “This is Tesco and the really expensive thing for me is fruit” (figure 6, 1C)[W1,RPa]. Students noted the financial difference between home and international students making the point that Scottish students enjoy free university tuition, “They’re from Scotland and they get paid from SAAS, they don’t have the high tuition fees that I have to pay” [W2,RPa]. Some of the students made reference to the legal difficulty of not being allowed to work in Scotland, “and the most terrible thing, I’m studying computing and even though I have a job offer I cannot work here….. it is not fair for me” [W2,RPd]. The majority of comments within this theme centred around exchange rates, “I’m from America and the exchange rate is terrible” (figure 6,1B) [W2,RPc]; “I’m from Canada…. I just feel like we are spending so much money” [W2,RPc]; “The exchange rate is getting worse, it’s getting more expensive for us to be staying here” [W3,RPa].

Cultural Themes
Icons that were categorised as cultural were the most common icons that were drawn across all 5 workshops. Three of the workshops drew icons relating to international student visa requirements. Figure 7 (figure 7, 2C) depicts one such icon, “Police say if you don’t follow the rule of the country then you will go to jail, so there is a lot of uh rules made in the UK” [W5,RPc] and other students said, “If you can’t get a visa then you can’t stay” [W2,RPd] and “I drew a visa because I am very aware of the restrictions that I have in travelling around Europe” [W3,RPb]. All of the RPs gave positive examples of Scottish countryside and historic places of interest (figure 7, 1A & 2B). For example a student stated, “I draw castle because there are castles everywhere in Scotland” [W3,RPa]. Many of the students drew pictures and discussed the culture of drinking of alcoholic beverages in Scotland, “There is a lot of whisky here, everyone drinks a lot” [W2,RPc] whilst others discussed local soft drinks, “Iron-Bru, I’m not a fan, it tastes like orange soda” [W2,RPc]; “No good coffee, the coffee is terrible” [W2,RPc]. Local food was discussed in many of the pictures with mixed results; “I don’t like the food here” [W2,RPc]; “Haggis, it tastes quite good but looks bad” [W3,RPa; “The food is really really nice but it is sort of limited, they don’t have too many vegetables here” [W3,RPb]. One student found that there was a high regard to food expiry dates, “People buy a lot of food in the supermarket but they also very emphasis on expiry date” [W3,RPa].

Some students found differences in local facilities, “Something that hit me is the different faucets that they have, one is for hot and one is for cold, so one is like ahh burning and the other is really cold” [W2,RPa]. Local transport was received well by the students, “The buses here are on time, the public transport system is good” [W3,RPa]. Local fashion was also mentioned, “A lot of people where tee-shirts in the winter when it is snowing.....People don’t feel the cold here” [W2,RPb]; “I can wear the tank top in Hong Kong but I don’t, I didn’t even bring it to the UK” [W1,RPb. In every workshop the Scottish weather (figure 7, 1B/C) was mentioned in a negative capacity; “It rains, it’s insane, the wind” [W2,RPc] “for some of the girls we have hair problems.....because of the rain” [W1,RPd]; “weather is always unpredictable here so if you have an umbrella in Scotland it is always a good idea” [W2,RPd]; “the winter, I hate the cold, I hate the rain. I am from Africa and I’m used to a free spirit and unity. Here I have to bundle up in jackets and I’m not used to it” [W3,RPa]. Many students drew positive icons relating to the countryside, mountains and lochs in Scotland with one student stating, “I love the trees and canal in Edinburgh” [W3,RPb].

Discussion
The data derived from this research is both valuable and diverse. In scholarly research, hand drawn pictures can be challenging to present as empirical data however when both pictorial and spoken description can be analysed simultaneously, by a team of independent coders, then the information derived from such data becomes original, explicit and authentic. The research question (page 2) asks, “what are the experiences, enjoyments and challenges of the international student community studying in a Scottish university”. We determine that the pictures and verbal communication have provided a unique insight into this question. The following section examines the findings identifying the experiences, enjoyments and challenges across all four themes.

In Table 2 we can see that there were eleven instances (68.5%) within the 16 RPs where students drew pictures regarding academic workload. Examples as shown in Figure 5 provide some of these pictorial narratives. Their associated verbal stories evidence the tension, anxiety
and stress students face when considering academic work. There were very few instances where students showed positive experiences of academic study which is possibly not surprising as the timing of this study was conducted early in a semester term time and students might not have received feedback or grades regarding their work. Negative correlation with Scottish weather was a strong aspect of discussion and drawing throughout many (56%) of the RPS. Students noted the challenges the changeable weather systems created. Sunshine was seen as a rarity in Scotland although it should be noted that the study was conducted in late winter and many of the students had not experienced a full year in Scotland. Other challenges which students demonstrated as challenging were more personal. Loneliness (25%) and missing friends and family (37.5%) were coded as having emotionally negative icons and verbal descriptions. It was clear that international students can find it difficult to be so far from home, family and friends and being in a new country can be a lonely experience, however, our study also found a positive correlation with icons relating to socialising and friends (31%). 44% of students drew emotionally negative pictures relating to the high expense of living in Scotland.

There were five instances of double theme coding between social and cultural themes (table 2). During analysis the coders found it difficult to distinguish between two of the themes for certain icons. For example, Cooking and food was coded as both social and cultural and drawn in 56% of the RPs with no noticeable emphasis on a positive or negative correlation. In fact, throughout the other four instances of double theme coding there is a similar neutral correlation suggesting there is no predominantly negative or positive emotion being presented. Thus, what we can determine is that food, exercise, language, nature and shopping are all remarkable, being worthy of comment and imagery, but they are not highly emotive experiences or challenges for the international students. Sightseeing in Scotland was a popular (50%) and positive repeating representation. Eight instances over the 16 RPs portrayed students enjoying mountains, lochs, castles and monuments.

Perhaps, if we might be indulged, the most iconic and memorable group narrative within this study was Figure 8. Here we see the group describing the divide between British and International students. The corresponding transcripts indicates the challenges this division creates, “Here the picture shows that even though we are in the same boundary, same region, same university, same student essentially, physically together, international and British students there is a division. Um and that division comes from language, culture, history, tradition. That causes international students to stick in their own groups and you can see that in classes as well. Very clear difference between British students from inside and international students from outside when working in groups” [W2, RPa]
Conclusion

To summarise, we have identified experiences and challenges of international students studying in Scotland through the RP method of enquiry. Our method of content analysis interpretation involved independent coders analysing the icons and transcripts to determine themes within a framework. This method of interpretation provides an opportunity for deep analysis of icons and group discussions to identifying instances of participant repetition both within and across themes. From this research, we demonstrate that the RP offers a unique platform for visual data capture within groups and thus, due to its rule-less structure, allows for a variety of experiences, concerns and narratives to be explored. We suggest that through deep analysis of the RP one can gain better understanding of stakeholder representation and accurately represent their realities in both diagrammatic and narrative form. In this study we analysed the RPs alongside the recorded post-picture discussion (where each group explains what they drew and why) using CA. The audio transcript helped to identify patterns from the pictures which might have been impossible to determine their meaning had there not been an oral description.

We suggest that visuals have the vast capacity to communicate irrespective of possible language, culture and education barriers however our interpretation method using content analysis is involved and specialised. We acknowledge that coding rich pictures is a lengthy and possibly expensive process which incurs a commitment of content data analysis from many coders (five coders in our study). Rich pictures are a good method of enquiry and can be equally used to gauge a ‘temperature’ or holistic understanding from stakeholders and in addition be analysed to gain a much more in-depth understanding of the situation under investigation. The RP is an analytical tool used to draw out tacit knowledge and beliefs of those who seek to understand their problem situation of system concerns. Such knowledge could be relationships, perspectives and undiscovered belief systems. In essence, we seek to explore maximum learning potential from the RPs and the process by which they have been facilitated analysed and disseminated.
Acknowledgements
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References


Maturity Models as a Tool for Benefits-Driven Change: A Qualitative Investigation of Ten Organizations.

Abstract

If Information Technology (IT) is to deliver change with clear benefits a complex mix of organizational resources (i.e. the IT capability), need to be mobilized. Improving IT capability is essential but often challenging for organizations. Maturity models are used to assist change management for IT capability improvement, but there has been limited research on how they are used and their efficacy in different organizational contexts. This paper addresses this gap through exploring the experiences of ten organizations who used the IT Capability Maturity Framework (IT-CMF), to help them address the challenge of gaining benefits from IT. Key topics are: motivations for using a maturity model; change management actions and improvements; success factors; barriers to success. The data was collected through qualitative interviews and interpreted through a benefits-driven change management approach. This analysis provides key insights into the context and challenges of using maturity models for IT capability improvements, and suggests that capability improvement will to some extent address the 'knowing-doing gap' highlighted with respect to maturity model implementation.

Keywords: change management; IT-CMF; maturity models; IT capabilities; benefits management.

1.0 Introduction

The problem of ensuring that investments in Information Technology (IT) improve organizational performance and deliver business benefits is a persistent one within IT theory and practice (Ashrafi and Mueller, 2015; Markus, 2004; Mithas et al., 2012). Recently, with the move towards digital organizations and the urgency to successfully manage IT-enabled business transformation in order to gain and retain competitive advantage (Hess et al., 2016; Seddon, 2014) this need has become more pressing. Maturity models are one tool that organizations can use to help them build the capability to plan and deliver the change needed.

Maturity models generally provide descriptions of maturity levels (normally five) ranging from low to optimizing within particular management areas. They can also be understood as a codified structured presentation of best practices around key organizational areas. Organizations can use them to assess their current maturity and identify their desired maturity. In this paper the use of the IT Capability Maturity Model (IT-CMF) maturity model in organizations is discussed. This paper’s contribution is
providing qualitative data from ten organizations on how IT-CMF has been used, and their reflections on how it may have contributed to their capability improvement in terms of planning and implementing change that delivers benefits. The authors interpret this data using the lens of a benefits-driven approach to change, and thus add to the understanding of this complex and persistent issue in IT management (Ashurst et al., 2008; Ashurst and Hodges, 2010; Doherty and Coombs, 2013).

The complexity of gaining benefits from IT is compounded by the fact that the introduction or development of new IT is nearly always part of some organizational change process with all the associated potential pitfalls (Ward and Daniel, 2006). IT and organizational change also have a complex and iterative relationship in that gaining value from IT requires investments in organizational change but IT itself also has an impact on the nature of organizational change (Gregor et al., 2006). Gaining actual benefits from this change process by clearly focusing on and managing the desired benefits as opposed to just outcomes is essential (Ashurst and Hodges, 2010; Doherty and Coombs, 2013). As highlighted by Coombs (2015), effective benefits management is dependent on developing the skills for managing change. There have also been calls for a framework to help in organizational transformation, for empirical research on change management within organizations and to identify critical success factors for the management of change (By, 2005). What ‘success’ looks like at the end of the process is also hard to ascertain, as concepts relevant to benefits such as ‘business value’ can be vague and open to multiple interpretations (Cronk and Fitzgerald, 1999) and the time lag for benefits can be long. This paper’s perspective is that building IT capability should be understood as a process of organizational change and it explores those changes through the perspective of benefits management (Ashurst et al., 2016; Ward and Daniel, 2006; Ward and Elvin, 1999).

Despite the increase in the number of guidelines and tools available for organizations, solving the problem of getting real benefits from IT remains a challenge (Doherty and Coombs, 2013). As argued by Jurison (Ashurst et al., 2008)(1996, p. 270), IT only has potential value and “whether it is realized depends on how effectively the benefits are managed for business results”. Differing perspectives on the benefits of IT can also cause problems for organizations in terms of blocking useful agreed approaches to improvement (Tallon, 2014). Chen et al. (2014) also note that our knowledge of the organizational processes which actually enable IT capability to improve organizational
performance is limited, and their work concludes that business process agility and environmental factors play important roles, but that more research is needed on how exactly they operate.

Increasing our understanding of what makes IT benefits materialize and ‘stick’ during a change process is crucial to improving the credibility and usefulness of IT research. Peppard and Ward (2004, p.189) state that:

“research to examine and understand how IS competencies and capability can be developed and sustained will provide a real source of value to organizations”.

1.1 The IT Capability Maturity Framework (IT-CMF)

Maturity models are conceptual models that provide guidelines, for example on strategy or processes, for organizations. IT-CMF is a capability maturity model with a focus on IT from a management perspective. Maturity models also facilitate benchmarking assessments and improvement roadmap planning, to guide organizations towards their desired maturity (Becker et al., 2010; Gottschalk, 2009; Hamel et al., 2013; Scott, 2007). IT-CMF adopts the 5-level maturity design structure of Capability Maturity Model Integration (CMMI) that has influenced and informed the development of many maturity models in IS research (Becker et al., 2010; Lasrado et al., 2015).

To remain competitive, organizations are increasingly adopting maturity models in order to assess and improve their capabilities (Lasrado et al., 2015; Mettler and Rohner, 2009; Scott, 2007). Some studies have shown that higher maturity levels lead to increased productivity and quality (Ashrafi, 2003). The potential role of maturity models is a theme of growing importance in IS research and a topic of great relevance to practice that remains relatively unexplored (Becker et al., 2010). This research makes a contribution to reducing these limitations in our understanding of maturity models. The remainder of this section provides some detail on the maturity model used in the research.

The IT Capability Maturity Framework (IT-CMF), (Curley et al., 2015) has been developed using design science methodology by the Innovation Value Institute (www.ivi.ie) as an academic/industry collaboration with several leading companies (Curley et al., 2012; Donnellan et al., 2011). For a discussion of how it has been used by Intel to improve IT capability in terms of sustainable IT see (Curry et al., 2012). The
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IT-CMF was used in the research because it was the maturity model the authors had used previously and it is also suitable as it is IT capability management focused. IT-CMF helps organizations to measure, develop, and monitor their IT capability maturity progression for maximum business benefit. It consists of 35 IT management capabilities and these are organized into four macro capabilities. Figure 1 illustrates the scope of the IT-CMF and the structure of its 35 Critical Capabilities (CC’s) which are defined as:

“a defined IT management domain that helps mobilize and deploy IT-based resources to effect a desired end, often in combination with other resources and capabilities.” (Curley et al., 2015, p.583).

![Figure 1: IT-CMF structure](image)

Figure 2 shows the summary maturity progression across the macro capabilities of IT-CMF. This level 1 to 5 structure allows organizations to pinpoint areas of low maturity that require improvement.
1.2 Research aims

The primary focus of this research is to provide useful insights for IT practitioners in how to make more effective use of maturity models to manage organizational improvement through capability improvement. The secondary aim is to investigate how useful Benefits Management (Ashurst et al., 2008; Ward and Elvin, 1999) is as a model for guiding, analysing and discussing how to plan, manage and analyse this maturity model based improvement. The authors aim to produce “relevant and timely” research (Davenport and Markus, 1999, p.20) and to “produce knowledge about how to intervene in the world and change it in order to satisfy real-world needs”. This research can be seen as part of the participatory research paradigm in the aim is to work with participants to develop improvements (Bergold and Thomas, 2012).

The specific Research Questions (RQ’s) are:

RQ1 What drivers motivate organizations to adopt IT-CMF and to carry out maturity assessments?

RQ2 What change management actions are taken in response to the maturity assessment result for improvements in capabilities and performance?

RQ3 What change management factors enable success in adopting the IT-CMF to realize value from IT?
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RQ4 What change management barriers or blocks have arisen in trying to adopt the IT-CMF to realize value from IT?

The experiences of ten organizations using the IT-CMF to enhance their IT capability are investigated. Each organization undertook one or more assessments using the IT-CMF assessment tool. The aim of the assessment is to identify gaps and develop a capability improvement plan for change driven by the organization. It includes training and awareness raising for staff around IT-CMF and capability improvement planning. They took the IT-CMF assessment to gauge their maturity levels in the 35 areas or critical capabilities (CCs) of IT, as covered in the IT-CMF. The results give them a current maturity score and a desired or target maturity score. The IT-CMF assessment also asks respondents to rank which areas of IT capability development are most important to them. The consultants carrying out the assessment then analyse this data to identify areas of high importance that also have a large gap between current and desired maturity. This provides guidelines on which CCs to focus on and what actions could be taken to improve capability.

This paper is structured as follows. Firstly, a review of relevant literature is provided to frame and justify the study. Then the research method is described, and results are presented within the structure of the research questions. Finally, some key themes arising from the data are discussed in more detail and the paper concludes with some implications for practice.

2.0 Literature review

The primary purpose of this section is to provide a critical review of literature relating to IT capability models as a tool for implementing change through developing organizational capabilities. The secondary purpose is to develop the theoretical context for the research, drawing on Benefits Management (Ward et al., 1996; Ward and Daniel, 2006) as a framework for benefits-driven organizational change.

2.1 Maturity models and capability improvement

There is limited data examining the effects of maturity models aimed at developing capability on organizations in terms of how the process actually worked (Reifer, 2000) and how they contributed to improvements, indicating meaningful change, rather than
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just describing their current state (Röglinger et al., 2012). Within the literature, there are some issues and limitations reported regarding both the theoretical foundations and the practical implementation of IT maturity models. Maturity models have been criticised for failing to supply adequate data that “more mature” does actually equate with better performance and results (Lasrado et al., 2015) and for not having a sound theoretical background or design approach (Mettler, 2010). How can we be sure that reaching a higher state of maturity, as described in a maturity model, necessarily leads to organizational improvements? Changes may happen, and they may improve organizational scores on a maturity scale, but this may not translate into significant results for the organization.

Becker argues that maturity models in IS research “require conceptualisations and analytical perspectives that are better grounded in theory” and he calls for researchers to conduct applicability checks with practitioners, to ensure the relevance of maturity models for practice (Becker et al., 2010, p.9). Many maturity models do not describe how to effectively conduct maturity improvements leaving a ‘knowing-doing gap’ which can be very difficult to close (Mettler and Rohner, 2009), p.1). Additionally, it has been noted that maturity models can challenge IT employees to go outside their comfort zone and learn new capabilities and skills that traditionally were not associated with the IT workforce (Scott, 2007) and that this process requires careful change management. There appears to be a gap in our understanding of maturity models ‘in use’ and the authors aim is to decrease this gap in terms of the IT-CMF and to explore how these insights might also relate to maturity models and there use as tools for change management in general. In summary, the literature suggests that maturity models do effectively provide organizations an accurate picture of current state and desired state, but that the process that needs to happen to get from one to the other is a complex change management issue, which often is not planned in an optimal way.

2.2 Benefits-driven approach to change: establishing a framework

Any increase in maturity is a change process, as it requires things to be done differently. As is well evidenced in the literature change is a complex and often contradictory process requiring both some stability and also shifts (Swanson and Creed, 2014; Thornley, 2012). As such, it needs to be planned for as part of improvement, but change perspectives tend to be underutilized within maturity model implementation (Mullaly,
2014). Research on success factors in realizing benefits from IT advocates a ‘maturity model’ to provide a structure for the practitioner as a diagnostic and planning tool for change, noting in their study that “Unfortunately, participants had not got a management framework in place for realizing benefits from any significant investment in IT through a long-term process of learning and change.” (Ashurst and Hodges, 2010). In a recent paper, Lasrado also calls for theories of change to be used to interpret the approach towards paths to maturity (Lasrado et al., 2015). It would appear then, that the combination of maturity models and carefully managed change for organizations could be a useful approach, but there is little empirical work on this.

2.2.1 Benefits Management
A key perspective informing this research is provided by a benefits-driven approach to IT-enabled change. The research draws particularly on the Benefits Management work of Ward and others, for example, see Ward and Daniel (2006). The main principle is that benefits will be gained from technology when people and organizations make changes which are focused on benefits the technology can bring (Ashurst et al., 2008) rather than the technology *per se*.

2.2.2 Capability improvement: a benefits-driven approach
The benefits-driven approach delivers benefits through organizational change, i.e. the business changes and enablers. The organization being changed can be considered as a group of substantive and dynamic capabilities (Zahra et al., 2006). Capability is the result of combining competences and resources to achieve particular results. The definitions of competence, resource and capability (Ashurst et al., 2008) indicate that capability is complex and change will affect a range of dimensions of the organization. Nicolian et al. (2015) conclude, in their CIO study on challenges of delivering value from IT, that for success it is necessary to build organizational competences.

Capability is a higher-level construct than competence (Stalk et al., 1991), defined and enacted through the application of a set of competences (Moingeon et al., 1998; Teece et al., 1997). More specifically, a capability can be defined as an organization’s ability to “perform a set of coordinated tasks, utilizing organizational resources, for the purposes of achieving a particular end result” (Helfat and Peteraf, 2003, p.1000). Capabilities are not static and Teece (1994, p.541) introduced the term ‘dynamic
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capabilities’ defined as “the subset of the competences/capabilities which allow the firm to create new products and processes, and respond to changing market circumstances”. This reflects how capabilities must anticipate and adapt to changes in the environment, and has since been further developed in the literature, for example, by Prieto and Easterby-Smith (2006) in terms of its connections with organizational knowledge.

The IT capabilities represented by IT-CMF provide a comprehensive picture of the capabilities relevant to IT, which are a central enabler for organizations to thrive in the digital environment. For capability improvement to be most effective in terms of improving organizational performance it needs to be channelled towards important areas of the organization in close collaboration with business leaders (Chen et al., 2014). Capability improvement must be coordinated in holistic way to ensure it effectively supports the needs of the organization (Fink, 2011).

2.2.3 A framework for change

There are many change models which analyse the various steps or stages of the change process such as Lewin’s (Lewin, 1947) 3-step model of unfreezing, moving and refreezing or Kotter’s (1995) model of change as an 8-step process. In selecting an appropriate change model for this work the authors took the lead from others who have done related work on IT and benefits and followed Ward and Elvin (1999) in using the change heptagon model, in conjunction with benefits management to analyse the contextual factors and dimensions of change. Ward and Elvin used the change heptagon as it shows the seven core components of change and additionally provides space for additional contextual issues surrounding these core components. In terms of their work, the IT-CMF assessment can be seen as an early stage of an intervention to start change and the actions taken in response to the assessment consist of the activities for intervention. The actions taken by the organizations in response to the IT-CMF assessment are analysed, in terms of the change heptagon components (see Figure 3). The change heptagon has the following dimensions (Ward and Elvin, 1999), p. 215):

**Strategy**: the changes imply a new or modified business strategy or component of it.

**Structure**: the changes to the organizational structure.

**Operational processes**: the changes affect specific business processes, which can be internal or related to trading partners.
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**Management processes:** new or modified management, planning or control processes needed.

**Technology:** describes the key aspects of the IS/IT components of the change.

**Roles/skills:** the changes require new/revised roles to be established or new skills developed in the business (and/or trading partners).

**Culture/behaviour:** attitudes and behaviour have to change in order to deliver the benefits.

![Figure 3: The change heptagon dimensions.](image)

The key concepts and framework for the study have now been introduced, the next section describes the research methods in terms of how the data was gathered to meet our research objectives.

### 3.0 Research methods

Due to the exploratory nature of the study, and to allow the flexibility to pursue new topics as the conversation evolved, semi-structured interviews were utilized to gain insights into the change management actions organizations are taking in response to IT capability maturity assessments and the resulting improvements in the capabilities and
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performance (Myers, 2013; Myers and Newman, 2007). The interview guideline consisted of sixteen open questions to enable the interviewees to relate to their individual organizational context. The questions were developed through analysis of the benefits management literature, discussion with practitioners and then refined through pilots. These questions are available in the Appendix.

The interviewees were from ten large organizations who had undertaken at least one IT-CMF assessment in the previous five years. Interviewees were sponsors of, or closely involved in, these assessments. In most cases the assessment was sponsored by the Chief Information Officer (CIO) or top IT manager. In a few cases, the Chief Executive Officer (CEO) was the sponsor. The participants were selected on the basis that they provided a representative sample of IT-CMF users based on size and sector. Table 1 provides data on research participants.

The research was guided by the Universities (identity and link to be supplied after peer review) research code of ethics. The participating organizations were coded to anonymize the source of the data. Each interview lasted approximately 60 minutes and was conducted by one of the three researchers, recorded and then transcribed. The transcriptions were sent to the interviewee for confirmation of the content prior to analysis and quotes were only used with prior consent.

The resulting qualitative data was analysed using thematic coding and categorization content analysis techniques (Flick et al., 2007) through researcher interpretation rather than using software. It is acknowledged that the interviews and discussions are constructed by the researchers and so will inevitably have an inherent bias (DeWalt and DeWalt, 2010). Each coder began by reading all transcripts. To reduce biases each transcript was initially analysed by one researcher who drew on common statements to form provisional categories and codes and then this was reviewed by the other two researchers and the final categorization analysis was consolidated by consensus. The initial findings of the research were also reviewed through a workshop with another group of twelve subject matter experts who had experience of the IT-CMF and its implementation. This review enabled validation and evolution of the findings with a senior group of IT leaders.
Table 1: Organizations participating in the research

4.0 Results
This section reports in detail the results in relation to each research question.
4.1 RQ1: What drivers motivate organizations to adopt IT-CMF and to carry out maturity assessments?

Drivers for the maturity assessment and use of IT-CMF were varied. Many organizations had a range of different drivers. A number of organizations wanted an objective external assessment and benchmarking with other organizations (A, B, C, F, G), to check out their own informal assessment of performance (C, E, D) and to provide IT business value information for business and top management (B, F, G, J). A second driver was to confirm areas where action for improvement was required (F). A third and important driver was to contribute to the process of change and improvement (B, D, E, H, I). Figure 4 indicates how the organizations are placed on two important dimensions that help distinguish the different drivers.

![Figure 4: Primary drivers for the assessment.](image)

Interviewees expressed views on the need for top management engagement. One felt that the process of assessment was itself a good way to develop communication and build stronger relationships:

“both the process and the output of the assessment can be used to facilitate improved communication. It was a way of communicating what had been achieved... and involving a wide number of staff in the overall direction and strategy” (H). “the
leadership recognized that there were gaps. We used the assessment to build momentum for changes” (I).

Interviewees also noted how an individual CEO or CIO could have a major influence on drivers and priorities.

4.2 RQ 2: What change management actions are taken in response to the maturity assessment result for improvements in capabilities and performance?

4.2.1 Findings and benefits from the assessment

All the participants in the research found the assessment useful:

“I strongly believe the approach is very powerful” (A);

“It's quick, it’s cheap and it's useful” (C);

“The key is the credibility of the feedback from IVI – because of the organizations that are members. The assessment method is valid and it works.” (I)

The majority of participants (6) felt there were “no surprises” in the assessment result, but that it was good to get confirmation of internal views and evidence to support making a case for improvement actions:

Some surprises did emerge. For example, when the assessment highlighted areas as needing attention and action was taken to improve these without it being requested or planned by management:

“How many of the capabilities improved even though there was no direct action taken on them, simply through getting people to think about doing things better.” (H)

“The potential for the process itself and the outcomes to facilitate and improve communications wasn’t a surprise to me, but I think it may have surprised some of the other senior executives.” (H)

For most organizations, the assessment is a part of a process of capability improvement. Two organizations illustrate very different aspects of change actions. Firstly, an example of the assessment leading to change of people:

“The assessment showed me that me and my team didn’t share the same view of the problems. We didn’t have the same appreciation of reality. It led me to the decision to reconfigure my team. I set up a new organization with new people at the top of my organization. The people having responsibilities at the time of the assessment are not here.” (E)

Another participant highlighted changes to culture:
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“They learned the value of benchmarking, the value of pausing and reflecting on methods and a more scientific approach. IT assessment is part of a new culture, a new way of thinking, a philosophy as much as a method.” (I)

Other participants gave examples of a wide variety of actions and changes that can be related to different dimensions of change. Factors often combined in the change process, as organization J noted, in terms of the relationship between awareness raising and leadership:

“We had a great blast of energy because once people saw the gap and they saw what – this is where the leadership comes in, the leader in the organization has to then create a compelling vision and a road map.” (J)

The change heptagon (Ward and Elvin, 1999) is used to explore the primary focus of action for organizational change to improve IT capability in the different organizations (see Figure 5).

Figure 5: Changes in response to the IT-CMF assessment.
4.2.2 Designing the change programme

No one referred directly to making use of frameworks such as the change heptagon in establishing an action plan. However, as figure 5 indicates, changes related to a wide variety of dimensions of the organization and important aspects of a benefits-driven approach to change were addressed (even if implicitly). It is interesting, given the IT context, that strategy, operational processes and technology & systems, did not come up as particularly prominent issues. This does not mean they were not mentioned but they were not priority issues. Rather, what might be termed the ‘softer’ or more culture- and people-focused issues were given a higher priority. In term of strategy, aligning IT change with organisational strategy was seen as necessary but there was no indication that organisational strategy might be influenced or changed as a result of innovation or improvements in IT. The priority given to changes in behaviour and culture reflects the approach taken in developing a benefits–driven approach. In large IT organizations there can be many people who need to work differently and the change programmes involved can be complex and challenging. Taking the perspective of benefits-driven change, the principle that benefits come from “people doing things differently” (Ward and Daniel, 2006), was highlighted by one participant:

“A change approach is required - ‘who’s job is going to change and how is that job going to change as a result of us trying to improve capability?’ Being able to tell that story or have a body of knowledge that would inform the changes has been the challenge to date. .. The organization won’t change unless the people understand how they can change themselves.” (D)

Several participants noted the importance of actions related to metrics and measurement:

“We introduced rigorous metrics and management oversight of reporting. We gained huge credibility as a consequence.” (I)

The impact of IT changes in terms of improved organizational performance, which was then measured through relevant metrics (Casey and Waring, 2014), had to be clearly communicated and explained so that everyone could see the benefits of the change. If this was not done, then buy-in was diminished. The next quotation was from a medical context and the participant felt that in such a high-risk environment effective communication of benefits was particularly important:
“If you implement these kinds of processes and you don’t give feedback to the staff ... they don’t understand why you are doing it.” (A)

In each case, organizations had to balance a variety of potentially conflicting factors when designing their change programme and action plan for improvement.

4.3 RQ3: What change management factors enable success in adopting the IT-CMF to realize value from IT?

A number of general enablers underpin the specific change and improvement programmes. A key planned enabler for one organization was to get better at the practice of change and improvement by focusing effort first on a small number of areas, using those to learn and build improvement capabilities. In another organization a key message was:

“delegate the ownership of capabilities to people ... in a position to do something about it and then ensure you give them time and space to do something about it.” (H)

Ownership and accountability for particular capabilities and their improvement was seen as an important enabler by organization J.

Participants noted that improvement needs several years, so there is the risk of loss of sponsorship from the CIO, CEO etc. as individuals change focus or move to new roles. As one organization notes:

“there was a big drive on service improvement with ITIL – so the focus shifted. There’s been significant re-organization as well, so some of the contacts we were working with have moved on.” (D)

Another participant highlighted the importance of vision and being prepared for difficulties:

“It’s a journey – create a compelling vision and organize around a few key things. You have to understand there will be setbacks.” (I)

Training and outreach in terms of effectively communicating with and involving the whole of the organization was raised as key enabler of success by organization J. Interestingly, the IT department (J) had thought it was doing an effective job of clear communication but feedback from the rest of the organization gained through the assessment indicated that it was not reaching the right people. Thus, the assessment’s engagement with wider stakeholders alerted IT to communication problems, which could be then be resolved.
4.4 RQ 4: What change management barriers or blocks have arisen in trying to adopt the IT-CMF to realize value from IT?

A major barrier was the failure to, adequately and convincingly, make the connection between IT capability improvement and specific business objectives or projects. This was reported as participants reflected on their experience of the process and how they would improve its success based on their experience. In their action plans participants wanted to make a strong link between actions to improve IT capabilities and business performance improvement:

“I think there is merit in being able to park capability improvement within a mega project...It's trying to create a bridge between that analysis and the business facing projects in terms of a cross mapping and we need these capabilities to land those projects.” (D).

“We are looking at how can we align sets of capabilities to support specific organizational outcomes... capability improvement I would say needs to be driven by organizational priorities and then you can use the capabilities in that context.” (C)

“A capability framework that drives their immediate business needs rather than the IT needs would probably have got better traction.” (B)

Any change initiative requires sponsorship, and the changes involved in improving IT capability can be significant. As one participant noted:

“It’d have been advantageous if we’d used higher-up sponsors”. (D)

Another potential barrier is the impact on individual IT managers. One participant highlighted that it was painful (but ultimately valuable) for the IT managers involved:

“There was a disconnect between what some of the managers thought of themselves and what the trained assessor discovered. It was moving from unconscious incompetence to conscious incompetence – a person can delude themselves and stick with their own little way of working. It was painful.” (I)
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There was also a perceived danger in an undue focus on the assessment of the current maturity level, rather than realizing that this could only be useful if it guided action on increasing maturity. This is linked to earlier observations in the findings that a long-term change programme view is required, as noted by Fahri (2015). Finally, there was a problem of ensuring executive understanding of the nature and purpose of IT-CMF, and, in particular, the meaning of the maturity scoring. There can be a discrepancy in score awareness between those familiar with using maturity matrices and those unused to such frameworks. In one case a low score was treated with derision, like a poor exam result:

“You only got X%??” (F)

“It can be hard to communicate that the 1→5 scale does not represent a Bad→Good progression, but... represents the particular organization’s business priorities, and in fact a high score can be a red flag for over-investment.” (F)

5.0 Discussion

This section synthesises and illustrates the main learning from the results in terms of how it relates to the existing literature.

5.1 Building capability as a change process

In many of the organizations the IT-CMF assessment was used on a number of occasions over a period of years. Development of IT capability using the assessment and IT-CMF framework, was recognized as a long-term process of change, driven by a focus on maturity improvements in areas recognized as a priority for the organization. The assessment itself is part of an educational and transformation process, so issues of understanding are likely to arise. In particular, the problems being tackled and the benefits arising from higher maturity levels may not be clear for participants struggling with very different challenges at lower levels of maturity. It has been argued (Doherty et al., 2012) that there is a mind-set shift to move to a benefits-driven approach. These transitions involving changes of mind-set are an important element of change management in improving IT capability. The importance of mind-set shift is also discussed in recent work on successfully managing digital disruption (Utesheva et al., 2016) which found that a clear focus on a desired future identity and a letting go of previous identities based on redundant technologies was a key enabler in allowing people to successfully adapt to digital transformation.
5.2 Embedding IT-CMF in the organization
The context for the adoption of IT-CMF varied widely between organizations. In one the CIO was pushing the capability-based approach, in other organizations, the capability concept was new. A number of factors identified in the research relate to how to approach embedding IT-CMF and capability improvement in the specific context of the organization. Sponsorship for the IT-CMF is important and organizations identified owners for individual capabilities as well as specific improvement initiatives. One challenge is how to engage both elements of the ‘double-knit’ organization (Wenger et al., 2002) i.e. the formal organization of structures, hierarchy and business processes as well as the informal organization of communities of expert practitioners and working practices. The importance of successfully building networks of influence laterally as well as vertically to enable the success of IT projects is also seen as crucial in more recent work on overcoming IS implementation barriers (Ngwenyama and Nielsen, 2014). The role of the informal organization in change and improvement is important (Casey and Waring, 2014; Fahri et al., 2015; McBride and Hackney, 2001). Two organizations illustrate these different factors:
“‘It’d have been advantageous if we’d used higher up sponsors’” (D)
“‘Delegate the ownership of capabilities to people … in a position to do something about it and then ensure you give them time and space to do something about it’” (H).

5.3 A benefits-driven approach to capability improvement
Organizations recognized a focus on benefits as an important factor in driving the maturity improvement process. There are examples of organizations taking change management actions to make improvements across a range of dimensions of the organization (people, structure, process etc.). An important challenge is: why should an organization focus on and invest in IT capability improvement? Organization C observed:
“‘Capability based improvement is a good thing. But, we need to be more driven from organizational objectives and outcomes, and then into which CCs need improving rather than focus simply on improving CCs.’” (C)
6.0 Implications for practice

This research investigated how organizations use the IT-CMF to improve their IT capability and implement benefits-driven change. IT-CMF has been closely developed in consultation with practitioners but its actual use in organizations over a period of time had not yet been fully investigated. In this section, a number of key implications for practice are highlighted, around improving the efficacy and relevance of the use of IT-CMF to support organizational change, but which will also be of broader relevance to making better use of other maturity models.

6.1 Gaining organizational commitment for change

Many of the findings reflect on the need to convince the wider organization of the actual value of investing time and resources in IT capability improvement. This is well-established guidance from the change management literature (By, 2005; Chrusciel and Field, 2006; Fritzenschafft, 2014; Kotter, 1995), but this work provides some insights into how this might be best managed in the particular context of IT management using maturity models. This is a challenge which can really only be addressed by each organization, as each will have its own understanding of business benefits. This also perhaps can have particular difficulties for IT which is often not represented at the top strategic level of organisations. The research suggests that a link should be established between improvement actions, business priorities and improvement programmes and a connection made between capabilities and organizational goals, both at the strategic and operational levels. This will help organizations turn the assessment into improvement plans using a benefits-driven change approach and improve the sustainability of the change programme required, as it is less reliant on local champions. The question of how organization-wide this input should be will also vary, with some participants suggesting a project-focused approach. The role of IT capability improvement can then be clearly connected to supporting particular project objectives/goals.
6.2 Understanding maturity
What is maturity and what does it mean for any particular organization? A comprehension or understanding difficulty came up as a recurring issue, as one participant noted:

“I actually have a slide that sort of illustrates the challenges with getting to a level 3 from level 2+ and the fact that it is not as expected.” (C)

This suggests that maturity levels can appear too abstract and the gaps between levels are not always as linear or clear as models tend to suggest, nor it is always appropriate to aim for the highest possible level. A supporting process such as a workshop, tailored to each organization, could assist in clarifying this for organizations and help to set realistic expectations in terms of maturity objectives.

6.3 Implementing IT capability improvement
Many organizations struggled with the practicalities of actually improving performance. There is the question of how widely across the organization one wants to develop capability improvement, and there is also the question of whether one wants to improve maturity in all or just some aspects of IT. Different approaches were developed by different participants. There may be a tension between the general cultural shift needed across IT, and also including the wider organization for capability to really improve, and the ‘quick wins’ available from a more focused approach. Engaging the appropriate people was seen as a key factor in implementation. In order to reach higher maturity, IT must work with the entire organization, but when it is starting on the maturity journey it could be a long way from this, so this ‘jump’ needs be planned and resourced. A clear message from the findings is that using a maturity model for IT capability improvement needs to be planned for as a change management programme. This needs the necessary strategic commitment and resources to initiate and sustain a shift in culture and mind-set, as well as sets of practices and processes. Without this, there is a risk that the assessment will just be seen as an informative snapshot rather than the start of an improvement process.
7.0 Conclusions
This research provides the first evidence of how organizations are making use of the IT-CMF to improve their IT capability and thus provides a contribution to our understanding of this particular maturity model. The maturity assessment process and IT-CMF framework are seen as useful and organizations have gained a range of benefits from their work on capability improvement. The research has also identified a number of practical implications for action to increase benefits realization by organizations using IT-CMF and this is likely to be relevant to other maturity frameworks. The benefits-driven change approach adopted for the research has been valuable. Conceiving the capability improvement actions taken by organizations as benefits-driven programmes of change is the basis for two important contributions. Firstly, in terms of research design, this approach would be useful in a range of qualitative research scenarios where the context is organizational performance improvement and change. The change heptagon was useful in structuring our key findings (see Fig.5). Secondly, the benefits-driven change perspective provides a way to approach IT capability improvement, which reveals valuable insights for research and practice. This provides support for the proposition made by (Ward and Murray, 2000) that Benefits Management can be applied to any change initiative and not just IT-enabled change.

The potential contribution of the research to practice is important. None of the participating organizations had adopted an explicit benefits-driven approach to change management and capability improvement. A key contribution to practice is the recommendation that organizations address capability improvement as a benefits-driven programme of change with a focus on benefits coming from business change enabling ‘people to do things differently’. The suggestions included in the ‘Implications for practice’ section outline potential opportunities for organizations. The authors believe these will to some extent address the ‘knowing-doing gap’ highlighted with respect to maturity model implementation (Mettler and Rohner, 2009).

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References


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Maturity Models as a Tool for Benefits-Driven Change: A Qualitative Investigation of Ten Organizations.


Myers, M.D. (2013), Qualitative Research in Business and Management, SAGE.


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Appendix

Interview questions

1. To start could you outline what was your role in relation to the IT-CMF assessment please.

2. Were you involved in the decision to undertake the IT-CMF assessment?
   a. If yes, what was the main (or many…) business issue (or could it have been an ‘IT’ Issue?) that motivated you/ your organization to carry out the IT-CMF assessment?
   b. If no, are you aware of what motivated your organization to carry out the IT-CMF assessment?

3. What is your recollection of the main findings from the IT-CMF assessment?

4. Where there any surprises?
   a. If yes, what were these?
   b. If no, why, would you say?

5. Do you recall if others in the organization were surprised by the results…. and in what ways?

6. Did the IT-CMF assessment help understand the main issues better?
   Issue A (Etc. for all issues mentioned)
   a. If yes, in what ways?
   b. If no, in what ways?

7. Did the IT-CMF assessment help you tackle the issue?
   Issue A (Etc. for all issues mentioned)
   a. If yes, in what ways?
   b. If no, in what ways?

8. Was there buy-in to the results of the Executive Assessment and the proposals for action?

9. What do you now do differently since taking the IT-CMF assessment? (& Why?)

Let’s take a few of these areas and explore them in more detail e.g.:

Do differently A (Etc. for other issues mentioned)
   a. What was the objective and intended benefits?
   b. What did you do?
   c. What aspects of the organization did you change (nb leadership, strategy, structure, process etc.)?
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d. What was your role in these changes?

e. What have the outcomes been?

f. What evidence is there of the benefits of these changes? Were there any additional or unexpected benefits?

g. What have been the key challenges?

h. What were the enablers?

10. What lessons has your organization learned from the IT-CMF assessment experience? Is there anything you would do differently next time?

11. What in your opinion are the benefits you (organization) achieved as a result of undertaking the IT-CMF assessment?

12. What will you (organization) do next in relation to capability improvement?

13. What are your views of a capability based improvement approach, based on your experience of the IT-CMF assessment?

14. Would you (organization) do an IT-CMF assessment again?

a. If yes, why?

b. If no, why not?

15. Would you recommend an IT-CMF assessment to a colleague in another organization?

a. If yes, why?

b. If no, why not?

16. Is there any additional comment you would like to make in relation to the IT-CMF assessment and its impact on the business value in your organization?
ICTs AND ENTREPRENEURIAL DEVELOPMENT: A CRITICAL REVIEW THROUGH THE LIVELIHOOD LENS

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Abstract

Whilst the concept of sustainable livelihoods is increasingly central to the debate about rural development, poverty reduction and environmental management, developing economies may not be able to fully utilise the potential of ICTs for entrepreneurial development in its agricultural economies and resource-based industries. The paper reviews the ICT literature through the livelihood lens and seeks to understand how the framework is useful for informal micro-enterprises in contributing to entrepreneurial development as a route to poverty alleviation. Analysing the literature through the framework, the paper highlights that ICTs offer a strategy to achieve sustainable livelihoods by increasing access to a range of livelihood resources, structures and provide institutional linkages, while reducing vulnerabilities and dependence on physical/natural resources. However, certain organisational, physical and human constraints may restrict the achievement of livelihoods outcomes within a specific context. To conclude, central to the framework, the author proposes how the framework may be extended through the capabilities vision to maximise the benefits that accrue from using ICTs in the informal economic sector.

Keywords: ICTs and entrepreneurial development, livelihoods theory, micro-enterprises, mobile phones, sustainable livelihoods, poverty, developing countries

1.0 Introduction

In recent studies the discourse amongst economists persists whether the focus on economic growth as an economic indicator is passable to reduce poverty in developing countries, or whether it is creating income inequalities. Although economic growth is not a guarantee of poverty reduction, it is believed that it is instrumental for sustaining poverty reduction over the longer term (Morgan, 2017; Bergmann, 2018).

While much heed is being paid towards approaches such as the livelihoods framework for achieving sustainable livelihoods (DFID, 2000), there is little understanding of how Information Communication Technologies (ICTs) can be utilised by the informal economic sector for stimulating micro-entrepreneurial development as a bottom of the pyramid (BoP)
venture. A BoP venture is a revenue generating enterprise that either sells goods to, or sources products from, those at the base of the pyramid in a way that helps to improve the standard of living of the poor (Prahalad and Hammond, 2002; Prahalad and Hart, 2002; Kuriyan et al., 2008). As some studies focus on the strategies that large multinational corporations use to operate at that BoP (Filardi et al., 2018), other studies portray a more complex picture with wide variations in terms of BoP contexts, of BoP initiatives and of impacts of the BOP approach (Antúnez-de-Mayolo, 2012; Kolk et al., 2014). Bottom of the pyramid approaches, such as market de-regulation and privatisation may stimulate the growth of micro-enterprises in developing economies that is regarded as a viable route out of poverty (Duncombe, 2006; Jagun et al., 2008; Prahalad, 2010). Although investments in ICT do not directly lead to poverty alleviation they support pro-poor growth initiatives that lead towards achieving the Sustainable Development Goals (SDGs) (Kenny, 2002; Heeks, 2008; Prahalad, 2010; ITU, 2018). As the bulk of economies in developing nations thrive on micro and small enterprises (MSEs), the role of ICTs to support micro-entrepreneurs for socio-economic development based on the principles of ownership, participation, co-operation, collaboration and capacity-building remains debatable (Duncombe and Heeks, 2005; Chew et al., 2011).

The aim of the paper is to critically review the literature on the use of ICTs by the informal micro-economic sector and frame the concepts under the elements of the livelihoods framework. By exploring some of the central issues surrounding ICTs as a ‘process or strategy’ for achieving the livelihood outcomes, the paper attempts to highlight some key issues linking ICTs with sustainable livelihood outcomes. Hence, the paper attempts to advance our understanding and contribute to knowledge related to the theoretical and practical implications of how ICTs may support the livelihood strategy for BoP ventures or micro-enterprises operating in the informal sector of economy in developing countries.

The paper is organised as follows. Section 2 defines ‘micro-enterprises’ and their classification as livelihood enterprises that is based on the literature. Section 3 highlights the role of ICTs to support the economic activities of micro-enterprises and micro-entrepreneurs operating in the informal sector. In Section 4, I have illustrated the ‘livelihoods framework’ as a theoretical lens for analysis and Section 5 outlines the methodology for the paper. Section 6 presents the analysis that is framed under the livelihoods framework and finally in
Section 7, I discuss the key arguments, conclude the findings and shed light on the contributions on theory and practice.

2. Micro-Enterprises as Livelihood Enterprises

According to the definition by the European Commission, micro-enterprises employ fewer than 10 employees and have an annual turnover or balance sheet below €2 million. (Economic Commission Act, 2003). In the literature, the term micro-enterprises differs according to regions, countries and contexts with inconsistency based upon attributes; such as number of employees, value of asset owned by the business and the volume of sales generated over a period of time (Frempong, 2009; Makoza and Chigona, 2012).

Micro-enterprises typically operate in the informal rural economic sector where the majority of businesses are unregulated, unlicensed and untaxed (Duncombe and Heeks, 2005; Smelser and Swedberg, 2010). They are also normally underfunded and unregistered to save costs from heavy government regulations that restricts productivity (Duncombe and Heeks, 2005; La Porta and Shleifer, 2008). The most numerous of these enterprises are sole proprietorships characterised by self-employment- often home-based, farm-based or street front businesses that are either temporary, part-time or full-time family-based businesses (Leidholm and Mead, 1999; Donner, 2007; Wolcott, Kamal and Qureshi, 2008). Micro-entrepreneurs operating in the informal sector are typically barbers, village phone ladies, shop owners, farmers, fishermen, fruit and vegetable hawkers, taxi-drivers, maids and tailors majorly run by women (Roldan and Wong, 2008; Makoza and Chigona, 2012).

Some scholars suggest that informal enterprises are more productive than formal micro-enterprises (Esselaar et al., 2007) but are kept from exercising productivity because of unfair taxes, burdensome government regulations. However, if these barriers are eased, they may register to become formal (De Soto, 1989). Other studies report that micro-enterprises stay small and unproductive in order to avoid detection by governments (Farrell, 2004). La Porta and Shleifer (2008) present data from a twenty-seven nation survey of micro-enterprises and argue that the ‘parasite’ nature of informal micro-enterprises undermine economic progress by stealing market share from formal firms. Hence, whether the economic benefits of informality are an impediment or an incentive for increased productivity and growth is
country specific and dependent upon the regulatory and enforcement of laws in the given context (Gelb et al., 2009).

Moreover, micro-enterprises are also categorised as ‘livelihood’ enterprises and are typically survivalists with a short-life span as they are established due to lack of employment opportunities and often abandoned when permanent employment is found (Duncombe and Heeks, 2005; La Porta and Shleifer, 2008). Poor households will generally step in and out of micro-enterprise activity depending upon the nature of the activity, seasonal demand, the availability of resources and personal and social factors (Duncombe and Heeks, 2005; Duncombe, 2007). Other studies argue that the proportion of earnings from micro-enterprises are either non-existent or very low for those in extreme poverty, but tend to increase in a fairly uniform manner for those who are less poor (Shaw, 2004). Hence, for most rural households micro-enterprise is a supplementary activity with the largest proportion of household income still gained from traditional sources; such as wage labour, crop sales and livestock sales (Shaw 2004; Duncombe and Heeks, 2005). Other scholars contend that the poverty reduction potential of livelihood enterprises is large as enterprise income may become part of general household funds and is used for investments in human capital and other substantial expenditure items (Midgley, 2008; Lateh et al., 2017).

Micro-entrepreneurs are critical to the livelihoods of the poor as they arguably create incomes and jobs and are crucial agents of change in the informal economy (Antúnez-de-Mayolo, 2012; Lateh et al., 2017). Other researchers argue that there is less clarity on the extent to which micro-enterprises contribute to economic growth (Berry, Rodriguez and Sandee, 2001; Duncombe, 2007). As the impact of livelihood enterprises on the macro-level seems to be somewhat limited; in terms of wealth creation, growth innovation and value-added exports (Duncombe and Heeks, 2005), at the micro-level there is optimism for the creation of sustainable structures for poverty reduction (Midgley, 2008; Agyapong, 2010). In 2001, the Digital Task Force’s report, ‘Digital Opportunities for All’ (DOT Force, 2001) emphasised the role of enterprises in igniting conditions for sustainable development as it is recognised that local entrepreneurs are much better placed to gauge local demand and general business conditions than those from outside.
However, there is substantial evidence that microenterprises face a myriad of challenges that curtail their growth and survival (Rogerson, 2008; La Porter and Shleifer, 2008). Shortage of resources (informational, financial, physical, natural, social and human), vulnerabilities from the environment (government regulations, taxes, weather, uncertainty of prices, risk), lack of structures (organisational, institutional) and inadequate processes to support micro-entrepreneurs for pro-poor growth activities are some constraints (Wolcott, Kamal and Qureshi, 2008; Makoza and Chigona, 2012). Other scholars argue that ICTs supporting the economic activities of micro-entrepreneurs may help them remain competitive in markets (Goods and Qureshi, 2009; Chew, Ilavarasan and Levy, 2011). Thus, it is critical to investigate how ICTs can be effectively integrated into the livelihoods framework to support micro-entrepreneurs at the BoP.

### 3.0 Role of ICTS to Support Micro-Enterprises

Information and communication technologies (ICTs) are defined, ‘as an electronic means of capturing, processing, storing and communicating information’ (Duncombe and Heeks, 2005). ICTs using digital information are transmitted over communication networks such as the internet. However, in developing countries, traditional ‘non-digital’ media are more widespread; such as information held as electromagnetic waves, example radio, television and analogue telecommunication networks (Kenny, 2002). Non-digital ICTs also include paper-based technologies such as books, manuals and newspapers, transmitted via written formal means or oral informal means, as held in the human mind as part of ‘indigenous knowledge’ (Duncombe and Heeks, 2005).

Few livelihood micro-entrepreneurs in developing countries have direct access to modern digital ICTs (Duncombe, 2007; Sey and Fellows, 2009). The majority possess traditional ICTs such as radio, with limited access to personal landline telephone and television due to the high costs involved (Kenny, 2002; Duncombe, 2007). Access to landline telephone and television depend upon the remoteness of the micro-enterprise and the local telecommunications and physical infrastructure including roads and electricity (Duncombe and Heeks, 2005; Wolcott, Kamal and Qureshi, 2008). Furthermore, computers and internet usage is also restricted reflecting on the low levels of broadband penetration in rural communities (Moyi, 2003; Donner and Escobari, 2010). Within this context shared access
models, such as telecenters, libraries and internet cafés play an instrumental role in providing access to computers and the internet for communal use (Sey and Fellows, 2009; Wolcott, Kamal and Qureshi, 2008). However mobile phones, with the highest penetration at the BoP in rural communities, are increasingly replacing other ICTs for micro-entrepreneurs (Donner, 2007; Donner and Escobari, 2010; Esselaar et al., 2007; Ilavarasan and Levy, 2012).

In this paper, the term ICT is not only limited to traditional non-digital technologies such as radio, television, and shared communal ICTs (such as public telephones, faxes, computers and internet) in community telecenters, internet cafés and post offices in rural communities, but also mobile phones used by rural communities.

4.0 Livelihoods Framework for Sustainable Outcomes
The sustainable rural livelihoods framework has a number of basic elements (DFID, 2000). The key question in the analysis of literature is:

Given a particular context (rural setting, policy, socio-economic conditions) how can ICTs as a livelihood strategy provide access to a combination of livelihood resources (different types of capital) and with what outcomes? The institutional processes (combining ICTs with the institutional formal and informal processes) mediate the ability to carry out such strategies and achieve (or not) such outcomes.

The framework is applied at the both the individual (micro-entrepreneur) and institutional (micro-enterprise) level within an informal sector in developing economies. Since micro-enterprises are instrumental in alleviating poverty, it may be argued that the livelihoods theory is a more logical framework to study the impact of ICT on the livelihoods of micro-entrepreneurs. A livelihood is defined as follows,

‘A livelihood comprises of assets (natural, physical, human, financial and social), activities, access to these (mediated by institutions and social relations) that together determine the living gained by individuals or households’ (Ellis, 2000).
In other words, a livelihood is a means for a living; utilising capabilities and assets to enhance opportunities (Chambers and Conway, 1992; Ellis, 2000) and is sustainable when it can cope with hardships and support a household to continue operating over a period of time (DFID, 2000). Within the context of this study, the study will analyse how ICTs ‘as a process/strategy’ becomes meaningful through certain ‘structures’ (micro-enterprises) that access ‘assets’ or ‘capabilities’ (human, social, financial, natural and physical capital) – via ICTs and operate within a ‘vulnerability’ context (environment) to affect certain ‘livelihood outcomes’ (increase in income, productivity, business growth, increase in social capital, improved well-being, restored human dignity and reduced vulnerability). Hence, these livelihood outcomes gain meaning through ‘structures’ that provide support through specific ‘strategies’ (ICT as a process) to achieve the livelihood outcomes. Figure 1 below illustrates the livelihoods framework that is adopted from (DFID, 2000) and applied in this study.

Figure 1. The Livelihoods Framework (DFID, 2000).

5.0 Methodology
This study adopts meta-analysis as a methodology for analysing the literature on ICTs for micro-entrepreneurial development in developing countries. The studies included in the
review were located through a comprehensive search of literature, mostly through manual electronic searches of the following databases: EBSCO, Primo, Google Scholar, SAGE Journal Online, ACM Digital Library, and Elsevier Science. Although search strategies varied depending on the tool used, some common keywords were used: ‘ICT and micro-enterprises in developing countries’, ‘ICT usage and micro-entrepreneurial development’, ‘ICTs adoption by micro-entrepreneurs’ and ‘ICTs, micro-enterprises and poverty alleviation’. The search initially yielded over 80 studies that were screened as part of the systemic review process. Finally, around 60 studies were selected for the literature review and purpose of framing the concepts under the livelihoods framework.

Although the literature focussed on ICTs usage within informal micro-enterprises in developing communities, the level of analysis does not distinguish between ‘micro-enterprises’ and ‘micro-entrepreneurs’. In accordance with the working definition for micro-enterprises (presented earlier in the paper), the review conflates both ‘micro-enterprises’ and ‘micro-entrepreneurs’ for analysis within the livelihoods framework. Also, it is noted that some authors used the terms micro-small and medium interchangeably in the literature, so with no commonly accepted definitions of the thresholds between micro-small and medium, there were often implicit conceptual overlaps between the acronyms in studies.

Finally, it is noted that the study is limited to the use of traditional ICTs such as mobile phones (excludes smart phones) which justifies its geographical focus on developing nations. This is because although poverty is prevalent in developed nations as well, however, the majority of population still have access to more sophisticated technologies. So besides culture, access and affordability of technology is central to the digital divide between the North and South.

6.0 Analysis through the Livelihoods Framework- ICTs as a Strategic Process/ Strategy

Drawing on reviews of the wider literature on ICT and entrepreneurial development, identifying what livelihood resources (or combinations of ‘capitals’) are required for different livelihood outcomes is a key step in the process of analysis. Understanding the diversified and unique contexts of how different livelihood resources are sequenced and combined by micro-enterprises/ micro-entrepreneurs in the pursuit of different livelihood strategies is
critical. The livelihood framework is used to map the concepts from the literature: ICTs as a ‘strategic process or ‘strategy’ that increases/ decreases access to capital resources (human, natural, physical, financial and social) for micro-enterprises which operate a vulnerability context (risks/ policies, regulations). Thus, unpacking of these livelihood strategies to examine the connections between such complex and dynamic processes for various ‘livelihood outcomes’ is a key part of the study. Moreover, it is noted that the livelihoods theory integrates different levels of analysis and action between the various actors and structures to illustrate the flow of information between them.

6.1 Increased Financial Assets
Within the livelihoods framework, ICTs are theorised as a ‘strategic process’ to stimulate productivity and business growth of rural micro-entrepreneurs (Duncombe and Heeks, 2005; Duncombe, 2007; Good and Qureshi, 2009). Hence within the livelihoods framework, ICTs increase financial capital and assets for micro-entrepreneurs (Esselaar et al., 2007; Best and Kenny, 2009) through increased revenue.

ICT innovation has enabled banks and microfinance institutes (MFI’s) to extend their outreach to more geographically isolated rural populations - via branchless banking channels that creates accessible, affordable and convenient platforms to deliver microfinance to informal rural micro-enterprises that were once beyond the frontier of formal financial services. As branchless banking provides rural micro-enterprises the choice to use a range of technologies ranging from automated teller machines (ATMs) and mobile banking for instance, these channels provide low-cost access and remittance facilities for micro-enterprises using mobile money (Mas, 2009). However, research indicates that the majority of micro-entrepreneurs fail to survive within their first year, but ICT’s may help them survive by providing them access to credit that is injected back into micro-enterprises for growth and development till they start generating their own profits (Wolcott, Kamal and Qureshi, 2008).

6.2 Increased Access to Information Assets
Research studies denote that ICTs provide key information and communication channels to support the value chain of rural micro-entrepreneurs in the informal economy (Jagun et al., 2008; Good and Qureshi, 2009; Frempong, 2009). Micro-entrepreneurs who cannot afford personal ICTs (telephones, computers, internet) and have restricted access to natural
resources (electricity, roads) use mobile phones to access information on price, buyers and sellers in the local market (Jensen, 2007).

In other cases, the cost of owning a personal telephone exceeds the benefit that arises from its use, therefore, organisations, such as internet cafés, telecenters or a localised business information centre (BIC), act as ‘structures’ to access market information for micro-entrepreneurs. In addition, these ICT structures provide assistance in enhancing individual’s digital skills in order to access information capital (Duncombe, 2007; Roldan and Wong, 2008). Roldan and Wong (2008) cited the example of ‘Cell Bazaar’ - a Grameen Phone service in Bangladesh that makes buying and selling goods over the internet easy for micro-entrepreneurs through Community Information Centres (CICs). The CICs are advantageous as they are in close proximity, are trusted and add value to information delivered to micro-entrepreneurs. Such structures are beneficial to informal micro-enterprises that do not have the money to invest in ICT resources but realise their value to business growth and productivity.

Furthermore, public telephone services and other shared ICTs facilitate the provision of wider choices for micro-entrepreneurs in terms of better prices when dealing with traders (Jagun et al., 2008; Ilavarasan and Levy, 2012). Studies show that micro-entrepreneurs are prepared to travel distances to use telephone services, such as public pay phones and teleshops (Duncombe, 2007) suggesting that they have an urgent need for their information needs. Public telephony plays a supplementary role by providing market information, while simple access to telephone services helps identify market niches to map out competitive behaviour, contact buyers and sellers and arrange transport for buying and selling activities (Kenny, 2002; Moyi, 2003).

Further analysis through the livelihood lens highlights that ICTs support the processes of communication for the poor in relation to supporting information channels for the delivery mechanisms for microfinance and prospects for trade. There is evidence indicating that the more remote the farmer or micro-entrepreneur, the greater the benefit of technology supporting the bottom of the pyramid (Heeks, 2009; Bergmann, 2018).

Also digital ICTs (email and internet) support networks of communication between community based organisations and other support structures through essential delivery
channels (Duncombe, 2007; Good and Qureshi, 2009). While certain info-mediaries are advocates on behalf of the poor and interact more effectively with relevant structures and processes, they must not distance themselves from the poor through the introduction of new ICTs (Duncombe, 2007). However, Heeks (2010) reports that the rapid diffusion of ICTs is an advantage, however it is rapidly being eroded and we should anticipate increasing examples of the type of ICT-enabled ‘disintermediation’ that has been seen in some value chains in the global North.

6.3 Increase in Social Capital
Within the livelihoods framework, ICTs increase ‘social capital’ for micro-entrepreneurs by forging linkages to sources of formalised and better quality market and business networks that strengthen social, cultural and political assets (Duncombe and Heeks, 2005; Duncombe, 2007; Good and Qureshi, 2009). Duncombe and Heeks (2002) in their study of rural micro-entrepreneurs in Botswana argued that micro-entrepreneurs rely heavily on social networks for information on prices, customers and suppliers. Therefore, ICTs play a critical role to build their social capital and by doing so, break the insularity of closed social networks. As a result, it helps micro-entrepreneurs access new markets for increased market share (Donner, 2004, 2006).

6.4 ICTs Create Linkages
Research studies highlight that ICTs enhance market opportunities for rural micro-entrepreneurs by connecting them beyond local informal markets to more formal markets through creating linkages and networks with actors in the value chain (Moyi, 2003; Duncombe, 2007; Good and Qureshi, 2009). ICTs help micro-enterprises establish effective and efficient networks, linking business to other individuals and enterprises across rural boundaries and penetrating into urban markets to enhance market opportunities for buying and selling. Hence, ICTs helps micro-enterprises to capture new markets and expand the customer base (Ilavarasan and Levy, 2012; Kolk, 2014). Consequently, more revenue and income is generated for micro-entrepreneurs that is interpreted as the desired ‘livelihood outcome’. However, within informal rural economies due to infrastructural constraints, such as limited internet penetration and weak mobile signals the development of e-business remains challenging (Chew et al., 2011; Ilahiane, 2012).

Other studies imply that while ICTs help micro-enterprises create institutional linkages with government enterprises and agencies, they may have a contradictory effect on local micro-
entrepreneurs though disempowering them and excluding them from national economic participation (Kleine, 2009). However, it is argued that while institutional linkages- via ICTs connect micro-enterprises to public/private organisations, such partnerships are not trusted by informal livelihood micro-enterprises as they reduce self-reliance and create more dependency on more powerful state actors (Duncombe, 2007; Kleine, 2009).

As stated earlier, ICTs connect micro-entrepreneurs to MFIs, mobile operators and banking agents through viable ‘institutional linkages’ to support their economic activities in delivering micro-finance to smaller businesses (Habib, 2012; Kauffman and Riggins, 2012). Under branchless banking, MFIs partner with agents and retailers to make financial services available to remote clientele, such as micro-entrepreneurs operating in the informal rural sector. This extensive network of banking and retail agents in geographically remote areas act as ‘intermediary linkages’ – linking micro-entrepreneurs with the financial provider or mobile operator to access mobile money. Such mobile banking models are increasingly popular in Africa and Asia (Heeks et al., 2014).

6.5 Reduction in the Vulnerability Context

Analysing through the livelihoods framework, the role of ‘structures’ or communal-based ICT models such as telecenters play a vital role in reducing risks for micro-entrepreneurs. By providing information on local micro-finance providers in the community, credit-rates and loan repayment facilities, ICTs reduce ‘vulnerabilities’ by mitigating risk. Moreover, the Grameen Village Phone Model in Bangladesh, hailed as the architect of micro-finance, is an innovative model of ICT based economic development that is widely promoted by international agencies to provide communal micro-loans to rural micro-entrepreneurs (Boettiggar et al., 2012; Habib, 2012). Also, Bruton et al. (2011) illustrate how micro-lending, a group-based lending process, plays a central role in reducing ‘vulnerabilities’ and supporting and monitoring member’s efforts to repay their individual loans. Each group has a leader who meets up with the borrowers and collects the loan. As the repayment process is structured and predictable, ICTs play a significant role for the borrowers in the group by providing communication channels between members of the group and group leader (Bruton et al., 2011; Habib, 2012). Furthermore, communal ICTs in post offices or local booths enable micro-entrepreneurs to connect with loan providers through informal communication channels (Boettiggar et al., 2012).
Within the livelihoods theory framework, the institutional, organisational and regulatory factors are critical to influence the economic ‘context’ for micro-entrepreneurs (Duncombe, 2007; Makoza and Chigona, 2012). With the introduction of branchless banking regulations, the rapid influx of mobile technologies creates a shift from the group lending model towards more individual-based lending, as the Village Phone model is becoming obsolete in some rural economies (Boettiger, et al., 2012).

Other traditional ICTs, such as the community radio and newspaper, are still regarded as the most popular channel in disseminating information to the rural poor – being the cheapest form of mass media. It is further noted that radio signals penetrate into geographically remote regions in rural areas that provide access to critical information for reducing risks (Kenny, 2002; Duncombe and Heeks, 2005). While providing region specific information in local languages, relating to local weather and local policies, these non-digital ICTs incorporate local concerns for rural entrepreneurs (Duncombe and Heeks, 2005; Duncombe, 2007). Critical weather data forms part of an early warning system that protects farmers against natural disasters in order to take timely and necessary precautionary measures for reducing environmental vulnerabilities. Also, information on improved seeds, livestock methods and new technologies helps increase productivity for the agricultural community (Duncombe and Heeks, 2005; Duncombe, 2007; Ilavarasan and Levy, 2012). Through the lens of the livelihoods framework, ICTs decrease vulnerabilities in the environment by providing accurate and timely information to reduce uncertainty factors and risks for micro-entrepreneurs.

Hence, it is argued that ICTs enable micro-entrepreneurs to survive in bigger economic markets by helping them access information on government policies, guidelines, regulations and taxes. In this respect, ICTs enable micro-entrepreneurs to articulate themselves so that they are able to influence and press government and other powerful organisations to implement favourable policies to reduce their vulnerability context (Duncombe, 2007; Filardi et al., 2018). However, Kleine (2009) criticises that while e-procurement is becoming popular, transparency between transactions provide more procurement choices to Chilean micro-entrepreneurs. This strengthens the bargaining power of larger actors in market economies, thereby, creating more inequality in markets that increases vulnerability for smaller micro-entrepreneurs.
6.6 Less Reliance on Physical/ Natural Assets
The literature signifies that ICTs have the potential to reduce the transaction costs associated with the exchange of information relevant to micro-entrepreneurial activity (Good and Qureshi, 2009). ICTs, such as mobile phones, can reduce the time and hence cost of a journey associated with market information, such as selling and buying prices (Jensen, 2007; Jagun et al., 2008). Moreover, the reliance on natural resources such as roads and transport is reduced as ICTs can eliminate the need for travel, hence reducing administrative costs for micro-entrepreneurs residing in rural communities. Hence, within the livelihoods framework, it is argued that there is less reliance on physical resources and Heeks (2009) reports that evolving web 2.0 technologies will displace ‘intermediary bodies’ in the value chain, hence reducing transaction costs for rural entrepreneurs.

7.0 Discussion and Conclusion
The paper concludes that ICTs offer a strategy to achieve sustainable livelihoods by increasing access to a range of livelihood resources, structures and creating institutional linkages, while reducing vulnerabilities in the context and dependence on physical and natural resources. Some livelihood outcomes that are presented in the study for micro-enterprises are; increase in revenue and profits, access to new markets; enhanced market opportunities, access to market prices and information, less reliance on physical/ natural resources and reduction in risks. However, other organisational, ICT infrastructural and human constraints may restrict the expansion of livelihoods outcomes within the context of the informal livelihoods micro-economic sector.

The paper reinforces the discourse that micro-enterprises operating in rural areas have limited access to the ICT infrastructure as poor internet penetration limits access to information, communication and resources. This is accompanied by lack of the enterprises investment in human capital or digital skills and knowledge in creating a digital workforce to engage in business activities (Wolcott et al., 2008; Makoza and Chigona, 2012). Hence, it is argued that ICTs will bring marginal benefits for micro-enterprises, unless they are applied to strengthen a broader range of human or capability assets in addition to building more effective structures and processes that favour rural micro-entrepreneurs and informal micro-enterprises. Thus, it is emphasised how certain organisational, physical and human constraints may restrict the achievement of livelihoods outcomes within a specific context. Hence, it is proposed that
ICTs coupled with Sen’s capabilities vision (1999, 2010) may offer alternative approaches to study how ‘freedoms’ can be achieved for sustainable livelihoods through building human and financial capital and mitigate vulnerabilities for micro-enterprises, especially for those embracing branchless banking channels.

The paper hence contributes to the theoretical literature by extending the livelihoods framework through the capabilities vision. Also, it reinforces the value of building physical and human capacities for ‘livelihood’ micro-enterprises that are already susceptible to environmental shocks such as inflation. On a practical level, it extends the understanding for micro-enterprises and micro-entrepreneurs related to the benefits from using traditional or digital ICTs to reinforce their business activities and channels for maximising growth and productivity as a livelihood outcome.

Furthermore, some authors criticise the sustainable livelihoods approach for having limited links to information and ICT because of the multiplicity of independent and dependent variables (Parkinson and Ramirez, 2006). The livelihood framework is primarily used by the development community as a tool of analysis to formulate poverty reducing strategies for individuals or households. Hence, the framework may not be appropriate to analyse business units such as micro-enterprises that afford a different definition to sustainable outcomes, as it was originally developed for analysing farmers within the agricultural sector. Also, in the case of applying the livelihoods theory to micro-enterprises, though it recognises the importance of ICTs in establishing linkages with public/private organisations and other regulatory bodies, it dismisses how such partnerships may interfere with the local developmental agenda for rural micro-entrepreneurs. Finally, the use of social media by rural micro-entrepreneurs although is becoming popular in the north, poor communities in the global south are still struggling to close this widening digital gap.

Notwithstanding, according to neoliberal thinking (Kleine, 2009), efforts to ‘tidy up’ the market or re-structure that is necessary for long term competitiveness weakens local micro-economies in remote locations and leads to regional inequalities. Further, the micro-macro linkages of economic actors with government bodies ignores the political economic context of governments, and efforts to embrace neo-liberal globalisation for socio-economic development may clash with local micro-economies. However, there is criticism that packaging an economic ideology into a seemingly neutral technology, reduces micro-entrepreneurs choices to decide collectively on the context or guidelines, and reduces their
freedom to choose the life they value. This clashes with Sen’s approach, so it is critical that collective choices be arrived through a political participative process and not be pre-empted by technology changes that reduce choice (Kleine, 2009).

References


Boettiger, S., Toyama, K. and Abed, R., ed. (2012). Natural Obsolescence of Village Phone Proceedings of the Fifth International Conference on Information and Communication Technologies and Development, Atlanta, Georgia USA, March 12-15 2012, ACM.


Towards an Evaluation Framework for Modelling Languages in Healthcare Contexts

Abstract
This research-in-progress paper describes a research agenda that aims to help IS practitioners and other stakeholders in Healthcare systems to determine which modelling languages are best suited for their problem. Overall the objective is to develop a research informed decisions support system that will recommend specific modelling language based on contextual requirements. The paper describes a research agenda designed to guide the development of this system using a mixture of empirical work and best practice from the extant literature.

Keywords: Modelling Languages, Healthcare

1 Introduction
The design, development and implementation of effective Healthcare Information Systems (HIS) is the pre-eminent concern of the discipline of Health Informatics. While the potential of HIS is widely recognised, the fulfilment of this potential represented an enormous, multifaceted challenge that requires full engagement from healthcare professionals, software engineering and systems development practitioners and the academic community. Successful HIS implementations require partnerships between a variety of stakeholders with varying needs, interests and objectives (Reid, Lotter, Burton, & Richardson, 2012). Conceptual models of data, processes and workflows play a vital role in enabling effective communication between these different stakeholders, particularly due to the dynamic and knowledge-intensive nature of these pathways (O’Leary, Noll, & Richardson, 2013).

There are a myriad of modelling language and tools. Based upon their syntactical and semantic structure, different modelling languages have different strengths and weaknesses. Some languages may use symbols to communicate processes and activities in an easily understandable, but imprecise manner, while others may have use a complex syntax to precisely specify requirements and relationships at the expense of ease of comprehension. The variability between the capabilities of different modelling languages means that different modelling languages are more or less suited to particular contexts depending on their syntactic and semantic properties.
Since modelling languages are enablers of crucial development activities such as requirement capture, systems analysis and prototyping, it is important that the most appropriate modelling language is chosen with respect to the particular context the development activity occurs in.

This research-in-progress paper describes a research agenda that aims to help IS practitioners and other stakeholders in Healthcare systems to determine which modelling languages are best suited for their problem. Overall the objective is a develop a research informed decisions support system that will recommend specific modelling language based on contextual requirements. The development of this decision support system will be informed by answering three main research questions.

RQ1: What are the key modelling requirements of modelling languages in various Healthcare contexts
RQ2: What are the strengths and weaknesses of various modelling languages
RQ3: How does the suitability of modelling languages differ between contexts.

Figure 1. Relationship of Research Questions to Project
The remainder of this paper is structured as follows. In the Modelling Languages in HIS section, we derive from the literature a list of requirements of modelling languages in Healthcare contexts. In the Proposed Methodology section, we describe how we hope to validate our list of requirements and address the other research
questions.

2 Modelling Languages in HIS

A model is an abstract representation of something. It seeks to capture the relevant attributes of an entity and represent them in a useful manner. Models of systems and processes play a crucial role in supporting the development of information systems (Bennett, McRobb, & Farmer, 2001). They support requirements capture and analysis. They are used to design, control and monitor system development and often serve a role in post-development validation and implementation (O’Leary, Buckley, & Richardson, 2013). Crucially, models of workflows and care pathways must be understood by many different stakeholders, who may have different experiences, backgrounds and knowledge (Shelly & Rosenblatt, 2011). In the healthcare context, modelling is recognised as providing a unique challenge caused by factors such as the unpredictable and dynamic nature of workflows (Hicheur, Dhieb, & Barkaoui, 2013).

The model of an information system is different and distinct from an instance of that information system. Similarly, the model of a health information system will be different and distinct from an instance of a health information system. A model will always be simpler and more abstract than an instantiated HIS. Models are described using a modelling language. A modelling language is any artificial language that can be used to express information or knowledge or systems in a structure that is defined by a consistent set of rules. There is an enormous variety of modelling languages in existence. Modelling languages can be graphical (e.g. UML), textual (e.g. PML) or mathematical. Modelling languages are designed in such a way as to balance a large number of competing attributes including, but not limited to, how easy they are to understand, how well they support the development of software and what kinds of different syntactic structures such as loops and conditional branching they support. Different modelling languages balance these competing requirements in different ways, and the syntax of a modelling language will have a major impact on the models that are created with it. Therefore, since the efficiency of a HIS is determined in part by the utility of the model, which is in turn partly determined by the choice of modelling language, it stands to reason that the choice of modelling language used is an important determinant of the eventual success or failure of a HIS.
3 Proposed Methodology

This research is envisaged as a multi-stage process where a number of subsidiary questions are addressed before the knowledge collected is synthesised into a whole that will provide empirical and best practice based guidance on what modelling languages should be used in particular healthcare contexts.

Stage 1: Initial Requirement Generation

The extant literature fails to provide a clear picture of the requirements of modelling languages in a healthcare context. The first step of this research project will be to conduct a systematic literature review of the literature on the modelling and development of HIS and healthcare pathways with a view to identifying the key requirement of modelling languages in these contexts.

Stage 2: Validation of Requirements

The proposed next stage of the research is empirical validation of the requirements derived from the literature in the first stage. A survey will be distributed to a wide range of stakeholders involved in healthcare into medical and IT professionals. They will be asked to confirm the relevance of the listed requirements and identify any requirements that are missing.

Stage 3: Mapping Contexts to Requirements

As part of the empirical survey, respondents will be asked to identify situations they require modelling languages for, and the relative importance of the various requirements in particular situations.

Stage 4: Evaluation of Modelling Languages

This stage will consist of a systematic literature review which will aim to identify the currently extant modelling languages and identify their strengths and weaknesses vis a vis the requirements identified in stage 1.

Stage 5: Mapping Contexts to Requirements to Modelling Languages

In this stage, the knowledge collected in the prior research will be synthesised to map healthcare contexts to their pre-eminent requirements to modelling languages that best meet those requirements.

References


Getting better value from IT: integrating organisational capability and skills frameworks.

Abstract

This paper reports on a collaborative project to integrate an IT organisational capability framework, the IT Capability Maturity Framework (IT-CMF) with an IT skills framework, the Skills Framework for the Information Age (SFIA). The aim is to develop an integrated tool and method for improving IT capability at a strategic organisational level through a focused improvement plan which also identifies key skills needed to drive that improvement. The research, policy and practice drivers are discussed and the method of mapping the two frameworks is described. Finally, the proposed user journey and prototype tools are described and plans for future development considered.

Keywords: IT capability, skills, IT-CMF, SFIA, maturity models, skills frameworks.

1.0 Introduction / Problem Statement

How can we best provide integrated support for organisations to strategically improve their IT capability in tandem with developing the appropriate skills of their people? This paper presents a research and development project in progress, which explores how skills frameworks can be optimally combined with organisational capability frameworks to drive overall improvement of the organisation’s IT capability. We consider ‘organisational capability’ as the effective mobilisation of the resources required to support the achievement of an organisation’s objectives (Peppard and Ward, 2004). These resources are typically defined as people, process and technology as shown below, adapted from (Ross et al., 1996).

![Figure 1: Resources for organisational capability](image)
We conceptualise IT frameworks as a synthesised and structured representation of shared knowledge from practitioners and literature of ‘what works’. There are two key types of IT framework available: one that focuses on people’s skills and the other that focuses on organisations’ capabilities. This prompted us to explore how we might best integrate different IT frameworks as needed when looking at a multi-faceted problem like improving IT capability. This project also aims to address the gap presented by the lack of existing tools and support to help organisations get started on using relevant frameworks together.

**Research Questions**

- How can individual skills development and organisational IT capability building be integrated to help organisations get better at using IT?
- How can developing tools that integrate an organisational IT capability framework (IT-CMF) with a skills framework (SFIA) assist organisations to effectively develop IT capability and IT skills?

This paper presents the first stages of a research project and discusses progress towards investigating these research questions.

**2.0 Methodological approach**

The primary objective of this project is to improve practical guidance to organisations rather than develop theory *per se*. Stage 1 of the research was concept testing of the initial proposition. This was done through a series of workshops with SFIA and IT-CMF users. Having established the potential value of the project we progressed to mapping SFIA and IT-CMF and developing initial prototypes and tools. These were further developed through iterative engagement with a range of relevant stakeholders (e.g. SMEs, education bodies, professional associations, and businesses).

The next stage is to trial a longer engagement, based on the ideas of Action Research (Ashurst et al., 2016; Lewin, 1951; Ragsdell, 2009), with a small number of organisations. They will use the tools, described in section 8.0, as part of an IT capability programme and feedback any learning from it into tool design and optimising ways to support their use. The data gathered will also provide insights to
the ongoing theoretical problem of integrating knowledge and learning from employees into organisational benefits (Kim, 1993; Vargas et al., 2016).

3.0 What are frameworks?
Organisational capability frameworks, sometimes also known as maturity models, are conceptual structures that outline key topics in any subject area and describe different levels of maturity. Maturity is generally scaled from 1 (low) up to 5 (high). Skills frameworks are similar in structure but, rather than defining organisational practices at different levels of maturity they describe skills. We based this work on two frameworks: the IT-Capability Maturity Framework (IT-CMF) (Curley et al., 2015), and Skills for the Information Age (SFIA) (SFIA, 2015). This is a collaborative project between the Innovation Value Institute, the SFIA Foundation, and the British Computer Society (BCS)-the Chartered Institute for IT.

The IT-CMF is designed around addressing IT Management needs from the perspective of organisational capability. It is a maturity model with 37 Critical Capabilities (CCs), each of which addresses a specific domain of IT management or operations across four broad ‘macro capabilities’. The CCs are structured around Capability Building Blocks (CBBs) which each contain 5 maturity level descriptions. The IT-CMF is designed to help organisations identify their current maturity, their desired maturity and it provides an improvement toolkit. This includes: maturity assessment questionnaires; white papers; practices, outcomes and metrics; KPIs; training resources.
SFIA is designed around identifying and addressing the skills required to manage and operationalise IT across 97 individual Skills grouped into 6 main categories. These skills are further described at different Levels, from lowest (1) to highest (7), which correspond to degrees of autonomy, influence, complexity and business skills. SFIA has been through several iterations (version 7 was released June 2018), but our initial work is based on version 6. The SFIAplus add-on, developed by BCS, breaks each Level-specific Skill into a series of Work Activities (WAs) that provide more detailed and modular descriptions. We used these for the mapping to provide the most accurate relevance judgements possible.
4.0 Drivers for research: literature and policy framework

The failure of IT to fulfil its potential to provide value and benefits to organisations is largely due to a lack of capability with respect to the management of those IT resources (Peppard et al., 2000; Peppard and Ward, 2004). If we consider ‘organisational capability’ as the effective mobilisation of the resources (i.e. people, processes, and technologies) to support the achievement of an organisation’s objectives (Peppard and Ward, 2004), then what role can the integrated use of supporting IT frameworks play in making the mobilisation actually effective? Empirical studies have demonstrated the multiple challenges associated with transitioning to a capable organisation i.e. one in which IT is focused on generating benefits and business value (Ashurst et al., 2011). At the same time, if an organisation’s structures do not support the full deployment and leveraging of skills, then the role and impact of skills development will be limited (Gama et al., 2011). There are also well-documented social and economic problems caused by inadequate or inappropriate IT skills, which are illustrated both at policy level in the EU (van der Linden, 2017) and more internationally (Anderson, 2014).

It should be noted that within IS research and practice it is certainly not ‘a truth universally acknowledged’ that organisational maturity models and skills frameworks are really making IT better and improving life for IT professionals. Recent discussion and research has suggested that the use of IT frameworks, with reference in particular to ITIL, can have implications for de-skilling IT workers by routinizing their tasks and focusing on subservience to business objectives (Trusson, 2018). In terms of maturity models there have also been critiques of the rigour behind definitions of best practice and the perennial difficulties of actually implementing change (Mullalay, 2014). We acknowledge that frameworks, almost by definition, can over simplify and, like any tool, can be used in unhelpful ways. We hope, however, that our proposed approach of integration may offer a more nuanced and ‘closer to practice’ tool for those wishing to improve IT capability. Indeed, one of the issues around failures in change management is often the lack of adequate thought regarding the skills and roles needed to drive and affect change (Sirkin et al., 2005).

5.0 Drivers for research: practitioner and partner input
Feedback from users of the IT-Capability Maturity Framework (IT-CMF) has indicated that while the capability improvement tools provide a roadmap of what to aim for, there is a gap in terms of how to go about enabling that and where to start. This is perhaps one aspect of Pfeffer & Sutton’s ‘knowing-doing gap’ (2000): a picture of where to go does not necessarily get one there. Similarly, input from our collaboration partners, the BCS, and the SFIA Foundation, indicated that users of the Skills Framework for the Information Age (SFIA) find it very useful for identifying skills gaps and training requirements. It does not, however, support as well ensuring that skill development really addresses organisational priorities in an evidence based manner, as there was no structured formalised assessment of current organisational performance or priorities. This also caused a weakness in demonstrating the impact on organisational improvement following a skills-based intervention, as no clear ‘before’ and ‘after’ picture of organisational maturity existed. This issue with SFIA is also discussed in a case study of restructuring the IT function of the Portuguese navy (Gama et al., 2011) that proposes developing an organisational improvement model in which to situate skills development.

IVI is engaged with a range of current EU initiatives around the development of an ICT Profession. Stakeholder input from these projects has also confirmed the importance of the relationship between individual skills and organisational capability (van der Linden, 2017) and the ways in which focusing on only one or the other does not reap optimal results (Plessius et al., 2018). In terms of new IS developments like Industry 4.0 a major organisational shift takes place but this is not always aligned with people and skill management (Helm and Graf, 2018; Kilic and Özkan, 2018) and this can result in failure.

Developing a holistic IT capability to include individual and organisational perspectives is important both from a theoretical and practice development perspective. In summary, it seems clear that this is a problem for organisations and that more could be done to help them. In particular, we could start by looking at existing frameworks and see if we can synthesise their content in a useful way. If the improvement tools can be integrated will that help?
6.0 Description of mapping methods

The frameworks were mapped to each other at the lowest possible level of comparable granularity: IT-CMF’s CBBs to SFIAplus’s WAs (see Figure 4). Although the mapping was done between IT-CMF and SFIAplus, the frameworks’ designs allow us to report relationships between the IT-CMF and SFIA at higher levels of abstraction. The CBBs offer the most detailed maturity-neutral description of an area of capability within the IT-CMF. Further elements of the IT-CMF that sit beneath the CBBs describe the capability in more specific maturity-defining ways. The WAs similarly offer the most detailed view of how a skill is demonstrated at various levels.

The IT-CMF CCs were grouped into clusters of related capabilities for mapping. Potentially relevant SFIA Skills were identified for each CC or cluster in several ways:

- Cross reference to a Skills/Capability correlation spreadsheet developed by a colleague at BCS
- Reference to associated Job Roles to identify relevant Skills and Levels
- Consultation with IVI Researchers and Subject Matter Experts specialising in particular capability areas
- Review of Skills list and descriptions to identify any additional potential corollaries

The list of WAs for each of the identified Skills were compared to the CBBs of the selected CC(s). Any WAs that were judged to fit within the requirements or actions described by the CBB were noted. Each CBB had multiple WAs mapped to it and
indeed, several distinct Skills areas usually contributed to each CBB. Similarly, WAs could be mapped to multiple CBBs (in multiple CCs) when relevant.

The mappings were validated through cross-checking mappings within the project team and other stakeholders.

7.0 Proposed user journey

While IT-CMF provides a roadmap of what an organisation needs to do to improve, skills frameworks are useful to identify skills gaps, developmental needs and training requirements. The integrated tool includes detailed maturity descriptions of practices, structures and processes and also an indication of what skills, based on SFIA, are going to be needed to implement those improvements and to operate successfully in the new improved state. Together, they are a powerful tool to help organisations identify their strategic priorities; design and support the implementation of holistic improvement plans; and demonstrate organisational improvement afterwards.

8.0 Prototype tools

Drawing on input from different potential users, we developed some prototype tools which we have tested at two user workshops to date. These included different methods of searching and presenting the Skills information related to specific
capabilities. We also developed tools for structuring and using the information such as improvement planning templates and outline job roles.

9.0 Next steps
Our next step is to further develop the prototype tools and trial them out. The aim would be to ascertain how different organisations go about using capability and skills frameworks together and what methods of integration and supporting tools are most useful. Finally, it would also investigate what supports in terms of training and consultancy input provide the most value. We would welcome the opportunity to discuss the work, demonstrate prototype tools, and get input on future plans with the UKAIS audience.

References


Mullaly, M. (2014), If maturity is the answer, then exactly what was the question?, *International Journal of Managing Projects in Business*, Vol. 7 No. 2, pp. 169–185.


EXPLORING SOCIO-CULTURAL FACTORS IMPACTING AGRICULTURE INFORMATION SYSTEM ACCEPTANCE IN RURAL NIGERIA AFTER TERRORISM

Abstract

Agricultural Information Systems (AIS) can provide several advantages for farmers in taking informed decisions regarding land, labour, livestock, and crop planning. However, there are not many empirical studies in examining the adoption of these AIS by farmers, especially in developing countries in Africa. This study adopts an unconventional socio-cultural approach in examining if the farmers think the use of AIS improves economic production, at the individual level of analysis. The purpose of this qualitative ethnographic study is to explore the socio-cultural success factors that improve employee acceptance of agriculture information system at some rural Nigerian farms. The results of this study could be disseminated to all rural Nigerian farm owners so they will know the critical success factors that improve employee acceptance of agriculture information system thereby increasing wheat production to reduce their national agricultural crisis. Another positive social change implication of the results of this on-going research would be to inspire researchers to replicate and extend this study in regions experiencing agricultural crises.

Keywords: Agriculture Information System, Farm Management, Crop Planning, Continuance Intention, Satisfaction, Expectancy Confirmation Theory.

1.0 Introduction

Despite overcoming Boko Haram terrorist insurgency, Nigeria is in an agricultural production crisis, importing significantly more wheat, rice and sugar at unfavourable currency exchange rates than what they could grow (Fawole & Ozkan, 2018). According to the Nigeria Ministry of Agriculture and Rural Development (SenseAgric, 2018), their essential bulk wheat import to export ratio is growing at an unsustainable 11% annual rate. A further complicating factor is that many male farmers were lost due to terrorism not to mention that some women were captured and mistreated (Lamboll et al., 2018). The loss of men and women in the farming industry has had an unknown impact on agricultural production and software acceptance.

The general business problem is that wheat production is too low to sustain the national demand because Nigerian farm owners do not know the critical success
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factors that improve employee acceptance of agriculture information system. A secondary problem may be a lack of resources due to Boko Haram terrorism (Lamboll et al., 2018). The specific business problem is that some rural Nigerian farm owners do not know the socio-cultural success factors that improve employee acceptance of agriculture information system in the context of a post-terrorism phase.

Agriculture is an essential contributor for economic growth, but emerging African nations significantly lag developed countries in effective food production and the outlook worsening (Michalscheck et al., 2018). According to Aker (2011), one of the reasons for this underperformance is the lack of adoption of advanced land use planning software, including agricultural information systems (AIS). Food supply insecurity and lack of self-sufficiency are significant issues for African countries. African countries met 89% of food production requirements in the 1960s, but this has gradually dropped to 75% by 2000 because of political, economic and environmental issues (Adeyemo, 2013). Many developing countries are now focusing on improving agricultural productivity through the use of information technology hardware and application software (Pinet & Papajorgji, 2014). The problem is we do not know if farmers in Western African countries would adopt and continue to use AIS.

We had previously conducted some quantitative empirical research to investigate the problem of agriculture information system acceptance preliminarily. We sampled rural farm employees in Nigeria. We used structural equation modelling to validate a software acceptance construct, and we found that several of the factors were significant. However, we were not able to explain what makes some farms more successful as compared to others, concerning improved agricultural production in the post-terrorism phase.

2.0 Literature Review

The theoretical reasoning of this research is anchored on Expectation-Confirmation Theory (ECT) which specifies how the regular usage of information technology could be sustained (Bhattacherjee, 2001). In the context of consumer behaviour, the study of intention to purchase or use a product can be explained using factors representing satisfaction, perceived usefulness, prior product/service experience, as well as other
variables including gender, socioeconomic status, education, age, and culture (Strang, 2018). However, when evaluating information technology, there is controversy in the literature about the predictors of customer behaviour, but satisfaction, perceived usefulness, and prior product/service experience are generally significant (Strang, 2018). In the case of AIS, users may recognize the technology to be useful, but it is unknown if they will continue to use this technology.

Successful implementation of agricultural information systems involves both access and usage of these information systems (Lu et al., 2015). Access to these information systems can be achieved by ensuring that adequate infrastructure is in place to ensure that farmers in rural areas have access to the technology. The usage of these information systems is harder to achieve as this process involves ensuring that the farmers understand and have adequate knowledge to use these information systems (Lu et al., 2015). Some of the factors that influence the adoption and usage of AIS in Sub-Saharan African countries, such as Nigeria and Ghana was the relatively higher levels of illiteracy because of which some of the stakeholders using these systems could not comprehend these systems (Chalemba, 2016). Considering the lower levels of education among a significant proportion of farmers in developing countries in Africa and Asia, achieving higher levels of usage of AIS is quite complex.

Several government and donor-funded projects have allowed implementation of AIS in several Sub-Saharan African countries, but the continued availability of these systems would imply that these systems need to be economically sustainable (Chalemba, 2016). The continual adoption and use of these systems would depend on the ability of farmers to maintain these information systems after the initial phase of funding by donor agencies is completed. According to Yong et al. (2015), the perceived usefulness of an information system also depends on the subject matter or technical content awareness of farmers, including their social situation, and infrastructure. Understanding the information needs of farmers is complicated, especially in an information-dependent sector like agriculture where farmers face new and slightly complicated problems on a regular basis.

By keeping the application of agricultural chemicals and fertilizers to an insignificant level, operating AIS improves cost-competitiveness (Husemann & Novkovic, 2014).
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AIS also provides an avenue where the environmental impact is controlled, thereby, making it more sustainable as well as increasing the yield of harvest (Husemann & Novkovic, 2014). Accurate records management enhances accountability (Fountas et al., 2015). Specific data from farm management information, together with yield, quality, and production records collectively provide safety and security of food can also be put to use as valuable agricultural information systems. The use of the data by multiple farmers to achieve efficiency reduces production cost. Hence, the adoption and use of AIS can offer several advantages to Nigerian farmers.

The analysis of AIS in a specific farming system can facilitate the identification of essential components and structure of the system (Demiryurek, 2010). According to Demiryurek (2010), the different sources of information used by various components in the system, the understanding of how successfully the system works, and how to improve system performance can be understood through this process. Customer satisfaction is referred to as the state in which the expectations regarding the features of products are met while dissatisfaction is said to occur where a customer’s hopes are dashed or expectations not met (Marić & Arsovski, 2010). Consumer satisfaction is a key determinant to the adoption and use of any information system. According to Oliver (1980), the two constructs that have a significant impact on consumer satisfaction are the performance-specific expectation and expectancy disconfirmation. Oliver (1980) explained that consumer satisfaction has a direct influence on attitude change and purchase intention. If a customer does not feel satisfied with a system or product, they are likely to not continue to purchase it or use it.

When studying attitudes about an existing system, researchers are interested in knowing the user intention to continue to use the system rather than the behavioural intention to purchase it, as would be the case in a marketing study. In this study, we operationalize continued use behavioural intent as continuance intention to use (CI). Therefore, the level of continued intention to use (CI) will be related and in the same direction as the level of customer satisfaction (CS) with an AIS system. Customers with low satisfaction of a product should have a low continued intent to use it and vice versa.
Motefakker (2016) further states that customer complaints are indicators of low customer satisfaction, but the absence of complaints does not indicate a high level of customer satisfaction (S). Customer satisfaction for a product or system is an overall end state view that a user forms as a result of using the system. Customer satisfaction is related to other factors that take place earlier in the process. A third factor, the confirmation experience (C), can explain the degree of assertiveness and confidence that the product performance meets specific performance requirements, which can later lead to customer satisfaction or continued use intention. The level of confirmation experience is closely associated with the continual usage of the system.

According to Motefakker (2016), the level of customer satisfaction (S) is related to confirmation experience (C) concerning how well the product meets specific performance requirements. According to Davis (1989), perceived usefulness (PU) refers to the extent to which a person believes that using a given modern technology will enhance her/his job performance. In Davis’ (1989) framework, PU is hypothesized to be the direct predictor of behavioural intention to use the technology of interest as well as with satisfaction (Pollard, 2015). Studies have shown that PU is positively associated with and influences continuance-intention (CI) when considering any new technology (Pollard, 2015). The level of confirmation and perceived usefulness are positively connected which indicates that the use of AIS will further enhance agricultural efficiency and sustainability (Hamid, Zaidi, Abu Bakar, & Abdullah, 2016). Therefore, confirmation experience (C) will be positively related to and influenced by perceived usefulness (PU).

3.0 Research Approach and Methods

The researchers held a constructivist ideology, focused on collecting in-depth information to understand the meaning of the socio-cultural factors that impact acceptance of agriculture information system by Nigerian farmers. Given this ideology, qualitative data will be collected, including demographic indicators along with open-ended questions to draw out the conceptualized factors. Since there were few studies of AIS use in Nigeria, and it was not practical to construct an experiment, a purposive sample was used.
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The purpose of this qualitative ethnographic study is to explore the socio-cultural success factors that improve employee acceptance of agriculture information system at some rural Nigerian farms. The target population for this study will be employees at three rural farms located in the agricultural-intensive plateau region of northern Nigeria. The central research question for this study is given below:

RQ: What are the socio-cultural success factors that improve employee acceptance of agriculture information system at some rural Nigerian farms?

3.1 Instrumentation

We will use structured open-ended interview questions to guide data collection, as listed below.

1. What agriculture information system do you use?
2. Why do you use or do not use agriculture information system?
3. Tell me about the positive and negative factors that impact your acceptance of agriculture information system?
4. How has terrorism impacted you use of software for agriculture production?
5. Could you tell me your non-confidential demographic factors: gender, marriage, languages, age group, experience level, education level?
6. Is there anything else you want to add concerning your acceptance of agriculture information system?
7. Is there any documentation I could have concerning your acceptance of agriculture information system?

The choice of ethnography rather than a case study method was made because we want to explore the socio-cultural factors. We already know that some farms are more successful than others. However, we do not know if the post-terrorism phase as impacted the social culture of rural farmers, or if other social factors are impacting the choice and application of software for crop planning. Case studies are the preferred strategy researchers employ when asking how or what questions (Yin, 2009). Case studies are ideal for identifying operational links among events over time (Yin, 2009). Ethnographic studies are unique in that they include fieldwork where all relevant participants are observed and interviewed informally rather than a specified number as in phenomenology or case studies (Strang, 2015).
Ethnography is the preferred methodology for this study because we intend to explore the underlying socio-cultural influences on cognitive behaviour of high performing rural Nigerian farmers who effectively use agricultural information systems. We will be able to effectively apply ethnography because all the authors are familiar with the methodology, we have access to the theoretical sample, and one of the researchers is fluent in the three languages spoken (as well as being an accepted member of the community). Thus, the research team is in a position to uncover deep underlying socio-cultural reasons that could explain what why and how the rural Nigerian farmers are more successful in accepting modern agricultural information systems than others in similar regions and post-terrorist circumstances.

3.2 Sample

The Jos area of Nigeria was of primary interest to the researchers. Jos is a plateau state bordered in the North-East by Bauchi State, in the North by Kano State, and in the North West by Kaduna State. In the South-West, it is bordered by Nasarawa State and in South-South by Benue State. The choice of Jos Plateau state for this study was based on the fact that it is an agricultural hub because of its favourable weather which supports crops all year. Additionally, most farm owners are using AIS. The Jos Plateau has an elevation ranging from 1100m to 1400m above sea level. The climate is characterized by two distinct seasons consisting of the rainy season spanning from April to October, and the dry season between March and November. The highest temperatures are usually recorded in March and May, while the lowest temperatures referred to as the Harmattan months are between December and January. The Jos Plateau accounts for over 75% of the total potato produced in Nigeria, other crops produced in the state include tomato, cabbage, carrots, lettuce, cucumber, green beans apple, grapes, yams, and onions. Cereal crops produced in commercial quantity (Ojo, 2005).

We do not know the sample size, but we estimate it will be at least ten farm employees. Bernard (2012) stated that the number of participants needed for a qualitative study such as ethnography was a number he could not quantify, but that the researcher takes what he can get it. Other researchers recommend a sample size of at least 4 participants for multiple case studies or ethnographies (Strang, 2015).
4.0 Anticipated Contributions of the Study

This on-going research is anticipated to make a contribution to a growing body of IS literature on the adoption of AIS by farmers. In fact, there are not many studies examining the adoption of AIS by farmers (Lu, Pan, Lu, Qin, & Wang, 2015). Thus, the current study addresses this gap in the literature by empirically studying the adoption of AIS in Nigeria by rural farmers using a model developed from ECT, which is a construct explaining how information technology use can be sustained (Bhattacherjee, 2001). In this study, we will take an unconventional socio-cultural approach to examine if farmers think agriculture software improves economic production, at the individual level of analysis. Food production is a necessity for survival, but it has been negatively impacted by unstable financial markets, climate change, political upheavals, and health pandemics, especially in African-based countries (Lamboll et al., 2018). Governments in developing countries across Africa are financially supporting the initial implementation of AIS, but these programs may be fatally flawed because investors do not assess the farmers’ continued use intention. The findings from this study should assist governments in the countries across Africa in benefitting optimally from the use of AIS.

More than one researcher found that Nigerian farmers need to adapt modern information technology to improve the agriculture value chain efficiency (Fawole & Ozkan, 2018) and crop risk management (Lamboll et al., 2018). Some researchers studied the results of government funding to promote agricultural socio-economic benefits in developing countries, but it remains unclear how Nigerian farmers perceive technology or if they will continue to use it to improve production in the post-terrorism era (Fawole & Ozkan, 2018; Michalscheck et al., 2018). The findings from this study should help Nigerian farmers in adopting information technology to improve the agricultural value chain efficiency. Additionally, the results could inform government policy making concerning funding and training for the agricultural sector.

References

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BUSINESS PROCESS MODELLING NOTATIONS TECHNIQUES: A COMPARATIVE STUDY USING AHP

Abstract

The rapid evolution of information systems has triggered drastic changes in business schemes. This phenomenon has led to the rise of Business Process Management. Business Process Management consists of the concepts, methods, techniques and software tools that assist the life cycle of business processes. The implementation of BPM solutions is not an easy task due to the existence of different Business Process Modelling (BPM) techniques. Thus, organizations seek for BPM to make informed decisions about the appropriate technique that fits their needs. In this research, we proposed a new comparison model for selecting the most appropriate Modelling technique using a Multi-Criteria Decision Making Technique, which is Analytical Hierarchy Process (AHP). Precisely, we compare four BPM techniques: BPMN, RAD, IDEF3 and EPC in term of three main criteria which are: Direct Representation, Automation, and Open standards. The results show a ranking list of the selected techniques. According to our analysis, BPMN represents the best technique compared with the designated criteria, followed by Event-driven Process Chain, then RAD and finally IDEF3.

Keywords: Business Process Management, MCDM, Business Process Modelling Notation; BPMN; RAD; RPC; IDEF3

1.0 Introduction

 Nowadays, rapid economic scenarios become a critical factor for the competitiveness of organizations. It emphasizes the need to identify the organizations’ processes as important elements in reducing costs, improving productive quality, focusing on the operational dynamics to provide automated solutions for their processes (Mendling, 2016). During the last decade, many research efforts have been focusing on optimizing and providing constant innovation of these techniques, resulting in a significant competitive advantages for the organizations in their market (Krishna and Emmanuel, 2015, Spanyi, 2015, Conger, 2015, Duipmans and Pires, 2012). Organizations use Business Process Management to support and maintain their practices and solutions, which promote the integration of business processes with people and systems, through a continuous and transparent flow of information. Accordingly, Business Process Management is not a product or a tool or software, but an approach to achieve a business strategic objectives (Jeston, 2014).

A business process is defined as “A structured and measured, managed, and controlled set of interrelated and interacting activities that uses resources to transform inputs into specified outputs” (Kalpič and Bernus, 2006). Modelling business processes is the
activity of representing the current state (As-Is) and the future state (To-Be) processes for comparison and contrast, so as to allow the analysis and improvement to reach the desired situation, these models are built by business analysts and managers (Kalpič and Bernus, 2006). This study defines a reference for decision makers to adopt the business Modelling technique that best suits their needs by assigning different weights to each of the criteria evaluated in this comparative study as a complement to the decision-making process.

The overall purpose of this work is to propose a new model for selecting the most appropriate BPM technique based on three main criteria which are: Direct Representation, Automation and Open standards. Specifically, this paper proposed model to evaluate the various techniques and compare them, then, draw conclusions from the comparison to determine what technique is best for the BPM of the organization.

The rest of this paper is organized as follows. Section 2 describes related works; Section 3 provides a description of the evaluated BPM techniques, Section 4 presents our comparison criteria in details. Section 5 involves the evaluation model, section 6 presents evaluation and results, and finally the conclusion and future work are made in Section 7.

2.0 Literature Review

In this section, we review related work in the areas of business process management that compare different Modelling techniques, as well as their methodologies and conclusions. Then we discuss the Multi-Criteria Decision Making techniques (MCDM). In terms of comparative studies, there were a limited recent papers which cover a large numbers of BPM techniques, in this section, we list some of these studies. Authors in (Weske, 2007) review only three BPM approaches, which are the Object Management Group (OMG) standard BPMN in its latest version 2.0, and the workflow models and their reference implementation Yet Another Workflow Language (YAWL). They show how the three methods fail to give practitioners a fitting exactly means and constantly to capture business scenarios and to examine, communicate and control the resulting models. On the positive side, they extract from their review six criteria which can support to identify effective tool-supported business process specification and Modelling techniques.
(Geambaşu, 2012) conducted a comparison study of the current BPM technique to in choosing the right choice. Their study comes to prove the previous researches that have assessed BPM techniques. The comparison presented in this work is concentrated only on two graphical techniques for business processes which are: BPM and Notation (BPMN) and Unified Modelling Language (UML). The comparison criteria selected for the study were the capacity of being easily understandable, the capacity of the graphical elements of BPMN and UML to describe the actual business processes of an organization and the ability to map with business process execution languages. The final results of comparison and evaluation between BPMN and UML AD against each of these three criteria conclude that both BPMN and UML AD were equally in terms of the ease of understanding by the stakeholders involved in BPM. In terms of the Workflow Patterns framework, both techniques showed that they provide similar solutions for most of the proposed patterns. The complexity of the graphical symbols utilized to describe the actual business processes of an organization, both of techniques use similar symbols to describe business processes.

(Pereira and Silva, 2016) conducted a state-of-the-art study of the related literature was made to provide a comparative study of five BPM languages to emphasize their strengths and significant weaknesses of each one, to draw a comparative view between them. Authors have produced a comparative framework in which each one of the languages is defined regarding a number of related criteria. Then, they developed a prototype to verify the proposed framework and to assist users in determining a suitable BPM language, based on their specific needs.

2.1 Multi-Criteria Decision Making
Multi-criteria Decision Making (MCDM) techniques aid decision-making process in examining different tools selection criteria, assessing CASE tools alternatives and making desired preferences (Majumder, 2015). There are numerous methods of MCDM, some of these methods have complicated mathematical models, which often depend on the termination of subjective parameters, or performing complicated mathematical routines. Because of this, many companies avoid using these methodologies and continue to use traditional methods of decision, which depend on the feeling and expertise of the decision maker, which have the probability of success of failure (Medineckiene et al., 2015). These traditional methods can be improved through the use of MCDM.
Due to the development of high-performance computing and usable software, the decision maker can now clearly express their preferences, without thinking of the mathematical algorithm behind these methods. Various MCDM techniques have been created for this purpose, include - but not limited to - The Analytical Hierarchy Process (AHP) and Preference Ranking Organization METHod for Enrichment Evaluations (PROMETHEE) (Saaty, 2008, Behzadian et al., 2010). In this work, we choose AHP technique for its simplicity and accuracy. More details about this technique in section 5.

3. Evaluated BPM Techniques

BPM is an abstract representation of real business process. Stakeholders adopt business process models for various purpose such as; understanding, communicating, improving, developing, automating, managing or executing a process (Sadiq et al., 2007). The best BPM technique that enable and matches these focus or objectives should be designated, it should also be able to provide the required information elements to its users (Bandara et al., 2005).

Many popular techniques are available for the purpose of business processing Modelling. Some of the most common techniques are: BPM Notation (BPMN) (Bandara et al., 2005), Data Flow Diagram (DFD) (Kang et al., 2015), IDEF family of languages (IDEF0, IDEF3), Role Activity Diagram (RAD) (Van Der Aalst, 2013), Activity Diagram and Event-driven Process Chain (EPC) (Riehle et al., 2016). In this study, we choose BPMN, RAD, IDEF3 and EPC to evaluate their strength in capturing informational process perspective along with other perspectives for a process, we intend to cover a wide range of techniques in the future work. The following section provides a brief description of the designated techniques.

3.1 BPM Notation

BPM Notation (BPMN) was developed by the Business Process Management Initiative (BPMI) which is a non-profit organization. The first specification of the BPMN standard was published in May 2004. Then in June 2005, the BPMI merged with OMG to work together on BPM issues.

BPMN defines a business process diagram based on a technique that utilizes flowcharts for creating graphical models of business process activities. A business process model is a network of graphic objects that represent these activities (e.g. tasks) and the flow controls define their order of execution (Bandara et al., 2005).
The primary goal of BPMN was to provide a notation that is readable and understandable for all business users, from the analysts who carry out the initial design process to the responsible of developing the technology to run these processes by business managers and control and monitor these processes. BPMN also supports an internal model to generate executable Business Process Execution Language for Web Services (BPEL4WS) (Betke et al., 2013). Thus, BPMN constructs a standardized bridge for the gap caused by differences between the business processes design and implementation.

3.2 Role Activity Diagram Language
Role Activity Diagram Language (RAD) was initially developed for Modelling work coordination in programming environments, but today it is most widely used in BPM for the existing process (As-is) and the future target process (To-be). RAD was created in 1986 by Ould and Roberts, who integrates the systematic technique roles and interaction models (STRIM) methodology. STRIM was also developed by Ould and Roberts research processes Modelling group. It identified five elements necessary for forming processes: roles, actors, interactions, activities and entities of the functions. Responsibilities assigned to an individual actor which is the process individuals or systems that perform specific functions at some point in time. Interactions are the elements responsible for synchronization, communication and data exchange between actors in the process. Activities are the elements that represent what and when a particular actor in performing its role. Finally, entities represent what objects send to each other through their interactions (Van Der Aalst, 2013).

In RAD, a process is charted in columns. Each column describes a role. Multiple columns imply that many roles can perform simultaneously. The vertical dimension of every column represents temporal priority ordering. In each column, many steps are applied. A process step is an activity to be conducted by the role. Each role has technique presents a role-centric view of business processes. It does not provide detailed information of activities and objects.

3.3 Event-driven Process Chain language
Event-driven Process Chain language (EPC) is also one of the Modelling languages of business processes that is most used worldwide. EPC was developed in 1992 by researchers at the University of Saarland in partnership with SAP, one of the world powers in integrated software production management. This language has grown and
expanded, even becoming one of the most recognized Modelling notations processes (Mendling, 2008). EPC is based on basic concepts of Petri nets (classic Modelling notation for distributed systems). Like most of the notations for Modelling processes, the EPC also utilizes the flowcharts to represent logical and temporal dependencies between activities in the construction of business processes (Riehle et al., 2016). The main focus of the EPC notation is to provide its users a graphical representation of organizational processes in an intuitive way, quick and easy understanding for the analysts and business personnel. In addition, the EPC is the main language for representation of business processes methodology of ARIS (Architecture of Integrated Information Systems), which combines the features relating to business (systems, data, etc.) and arranges them in order to ensure the development of activities sequences / tasks that produce value.

This notation is constituted by a set of basic and complex elements, the first set consists of functions, events, logical connectors and flow control, while the set of elements is represented by units/ functions, objects of complex information organization and delivery of objects. Events are responsible for carrying out the start of the process, which defines the state of the process or terminate the same preconditions mechanisms, which constitutes and post-conditions of a function. No situations can occur with two successive events and each event most have only one inlet and one outlet. Functions are elements that aim to represent the activities or tasks present in the business process. Generally, these activities are performed by people or systems. A function can be activated by an event of predecessor and may lead to one or more successors events.

3.4 Integrated DEFinition for Process Description Capture Method

Integrated DEFinition for Process Description Capture Method (IDEF) technique was specifically developed to describe the dynamic aspect of business processes and in order to facilitate the study and description of information systems. It is a technique that focuses on the temporal aspect of the process and to respond to the need identified previously in IDEF0 (Carnaghan, 2006). It describes two types of Modelling languages, one with the aim of describing the workflows of business processes and the other to define the state transitions of objects. Our research approach focuses more on the first type and for IDEF3 which describes a process as a sequence of activities. IDEF3 activities are recognized as units of behaviour, and relationships between activities are called precedence link. In addition there are also elements that control the flows which make divisions or seams along the workflow (Dumas et al., 2013).
This technique is very similar in composition elements to UML Activity diagrams, with the exception of events which do not have their own representation, for instance, there are no structures to represent the beginning and the end of the process explicitly. IDEF3 annotations are used to highlight the importance of functional decomposition processes and encourage their use. What is not always a good practice because if the process is long and complex it has to be divided into a lots of diagrams and sometimes it may be very difficult to understand and to get an overview of the process (although if the diagram root does not have great depth to give a highly structured process concept). For all reasons, IDEFs diagrams often accompanied with a tree diagram that describes the relationships between the various diagrams.

4. Comparison Criteria

As mentioned above, the BPM has a great impact on the success of any BPM project. For this reason, the choice of the appropriate Modelling language is not indifferent and must depend on the specific objectives of the Modelling project, which is to develop a simple documentation of business processes with a representation of their communication and dissemination among stakeholders.

Modelling processes also provides a further optimization of their operation. The four Modelling business processes languages succinctly presented in the previous sections have different characteristics, advantages and limitations. The important step now is to find a proper methodology and criteria to compare their differences and similarities in a systematic way. Our comparison criteria are defined in three categories that constitute the pillars of MDA (Model Driven Architecture). These criteria were proposed by IBM in MDA Manifesto (Selic, 2008). Which are: (I) Direct representation which focuses on the problem domain, (II) Automation of tasks and (III) Open standards that allow interoperability of tools and platforms. Table 1 presents a summary for these criteria with their acronyms.

4.1 Direct Representation

This main category refers to the reduction of semantic gap between the problem domain and their representation in a model, so that permits a direct coupling of the solutions to the problems which will be built. It contains the following sub-criteria:
4.1.1 Adoption of Computation Independent Model (CIM)

CIM refers to the Modelling from a computation independent viewpoint, CIM is a model of a system which represents the system in environment in where it will operate, and as such it helps to show what is expected from the final system.

4.1.2 Structure and Behaviour

The ability to represent the structural and organizational behaviour through business process views.

4.1.3 Business Rules

Support of business rules Modelling, due to the highly changeable nature of these elements in the evolution of business processes and models, users should be able to visualize and manipulate them clearly.

4.1.4 Roles

The ability to represent the different roles that perform different functions in business processes.

4.1.5 Business Objectives

Ability to represent business objectives, inputs and outputs information on the process activities, either in the form of documents (structured information) or messages (unstructured data).

4.1.6 B2B (business to business)

the ability to represent business to business (B2B) interactions, so that assuming collaborated external organizations as an external role in the process.

4.1.7 Usability

Usability for non-technical stakeholders, such as business analysts, managers or process designers. These stakeholders are the ones who know the business, and often is part of the same processes.

4.2 Automation

In this category, we measure the ability of business Modelling techniques to support the automation of software development tasks. It ensures how the productivity could increase, and the required effort is reduced. It is one of the fundamental purposes of the emerging discipline of engineering models. It involves the following sub-criteria:
4.2.1 Methodological support
Support for business Modelling and process execution to provide a clear and concise guidance on how to build a model that represents the business in all material respects.

4.2.2 Modelling-implementation gap
The gap between Modelling technique and execution of business processes. Business models must be ready to enable the automation of business processes.

4.2.3 Runtime
Existence of a runtime infrastructure environment or standard execution of business processes model. Process models should have a direct mapping to the production environment where they will maintain the processes.

4.2.4 Service Oriented Architecture (SOA)
Compatibility with current strategies for composite business applications architectures, such as SOA, which characterized as a distributed, loosely coupled and direct support for business processes.

4.3 Open standards
In this category, each Modelling technique assesses the ability to promotes the development of an ecosystem of interoperable tools for different purposes. It consists of the following sub-criteria:

4.3.1 Industrial Consortium Support
Support by a consortium of open standards recognized by the industry, by measuring the experience of the tool in the field.

4.3.2 Meta-model available
Existence and availability of meta-model which adopted by the OMG (Object Management Group) to enable the transformation of models.

4.3.3 Modelling Framework
Implementation of meta-model in a Modelling framework as proposed by (Behzadian et al., 2010), and the use of transformation tools to facilitate the mapping of other types of models on other levels of abstraction.
4.3.4 Open source tools
Existence of open source tools that support the technique to obtain the benefit of the communities that provide free software development.

5. Methodology
The rating given to the comparative study is based on the application of a case study developed by each of the techniques described in Section 2. The case study is regarding the Ph.D. Proposals Submission and Acceptance Process in Information System Department (IS-Dept.)-Computer and information systems College (CCIS), King Saud University. The business objective of this case study is to ensure effectiveness and efficient of the procedure. The main stakeholders identified in the business process are the Ph.D. Candidate, Advisor, IS-Dept. PhD. Committee, IS-Dept. Council, CCIS Ph.D. Council and Review Panel member. To evaluate the techniques, we collect and analyse judgments from ten BPM experts, which are members of King Saud University, Vice Rectorate for Planning and Development, Quality & Development Deanship to measure the relative importance of each criterion using ExpertChoice to calculate the final priority and check the consistency. Table 5 shows the total ranking of the criteria by the evaluated techniques while the average of the ranks illustrates the level of adoption of each criterion on a scale of one to five. The averages by category shows how the business Modelling techniques are evaluated concerning the direct representation, automation and open standards.

6. Evaluation Model
In this section, we will analyse the three BPM techniques to determine the most appropriate one among them. We will examine the three systems based on the proposed criteria. We applied a multi-criteria decision making (MCDM) technique. Many MCDM methods can be used for the selection process; however, here we applied The Analytical Hierarchy Process (AHP). Although, some additional features working for choosing AHP for the selection process have also been considered. AHP is an appropriate technique, especially when a limited number of alternatives needs to be assessed (Saaty, 2008, Majumder, 2015).

The first phase is the to prepare an evaluation task in which we should analyse user needs, assumptions, and limitations associated with the three techniques. The second phase is to identify and select the evaluation criteria relevant to these techniques.
In this respect, we developed the four main criteria and fifteen sub-criteria which discussed in section 4. Figure 1 presents the proposed hierarchy model for selecting the best BPM technique based on AHP technique.

### 6.1 Analytical Hierarchy Process (AHP)

AHP is a type of MCDM techniques, which break down a complex MCDM problem into a decomposed hierarchy (Saaty, 2008). Figure 2 shows the main steps of to apply AHP which usually consists of defining a goal, Structure elements in criteria, sub-criteria, alternatives, etc., Make pair-wise comparison of elements in each group, Calculate weighting and consistency ratio, Evaluate alternatives according to their weighting, getting ranking values, and making the final decision. AHP steps are discussed as follow:

**Figure 1. Hierarchy model for selecting the best BPM techniques.**

The table and diagram illustrate the hierarchy model with the following levels and criteria:

<table>
<thead>
<tr>
<th>Goal</th>
<th>Level1 Main-criteria</th>
<th>Level2 Sub-criteria</th>
<th>Alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Process Modeling Techniques</td>
<td>Adoption of CIM</td>
<td>Automation</td>
<td>BPMN</td>
</tr>
<tr>
<td></td>
<td>Structure and Behavior</td>
<td>Methodological support</td>
<td>RAD</td>
</tr>
<tr>
<td></td>
<td>Business rules</td>
<td>Modeling-implementation gap</td>
<td>IDE3</td>
</tr>
<tr>
<td></td>
<td>Roles</td>
<td>Runtime</td>
<td>EPC</td>
</tr>
<tr>
<td></td>
<td>Business Objectives</td>
<td>SOA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B2B</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Usability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct Representation</td>
<td>Methodological support</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Industrial Consortium Support</td>
<td>Meta-model available</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Modeling Framework</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Open source tools</td>
<td></td>
</tr>
<tr>
<td>Automation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open standards</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.1.1 Modelling the Problem

AHP decomposes a complex MCDM problem into a hierarchy model as illustrated in Figure 1, with the goal of evaluating and selecting the most appropriate BPM technique at the left. The alternatives (BPMN, EPC, RAD and IDEF3) at the right, and the criteria (Direct Representation, Automation and Open standards) and sub-criteria (Adoption of CIM, Structure and Behaviour, Business Rules, ... etc.) in the middle.

<table>
<thead>
<tr>
<th>Main Criteria</th>
<th>Acronyms</th>
<th>Sub-Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Representation</td>
<td>R1</td>
<td>Adoption of CIM</td>
</tr>
<tr>
<td></td>
<td>R2</td>
<td>Structure and Behaviour</td>
</tr>
<tr>
<td></td>
<td>R3</td>
<td>Business rules</td>
</tr>
<tr>
<td></td>
<td>R4</td>
<td>Roles</td>
</tr>
<tr>
<td></td>
<td>R5</td>
<td>Objectives and E/S</td>
</tr>
<tr>
<td></td>
<td>R6</td>
<td>B2B</td>
</tr>
<tr>
<td></td>
<td>R7</td>
<td>Usability</td>
</tr>
<tr>
<td>Automation</td>
<td>A1</td>
<td>Methodological support</td>
</tr>
<tr>
<td></td>
<td>A2</td>
<td>Modelling-execution gap</td>
</tr>
<tr>
<td></td>
<td>A3</td>
<td>Runtime</td>
</tr>
<tr>
<td></td>
<td>A4</td>
<td>SOA</td>
</tr>
<tr>
<td>Open Standards</td>
<td>E1</td>
<td>Support Industrial Consortium</td>
</tr>
<tr>
<td></td>
<td>E2</td>
<td>Meta-model available</td>
</tr>
<tr>
<td></td>
<td>E3</td>
<td>Modelling Framework</td>
</tr>
<tr>
<td></td>
<td>E4</td>
<td>Open source tools</td>
</tr>
</tbody>
</table>

Table 1. Comparison Criteria.
Applying pair-wise comparison

In this step, we compare all the items of each level in the hierarchy. This comparison produces a matrix of relative rankings for each level. This matrix usually called “judgment matrix”. The matrix satisfies the relation $= 1/aji$ as follows:

\[
A = \begin{bmatrix}
1 & a_{12} & \cdots & a_{1n} \\
a_{21} & 1 & \cdots & a_{2n} \\
\vdots & \vdots & \ddots & \vdots \\
a_{n1} & a_{n2} & \cdots & 1
\end{bmatrix}
\] (1)

The order of the matrix is dependent on the number of elements at its connected lower level. The pair-wise comparison is conducted based on Saaty scale described in Table 2.

Computing Eigenvector

Once pair-wise comparison is completed, eigenvectors are calculated. The eigenvector is measured by dividing each element of the matrix by the sum of its column elements. It is important to notice that the eigenvectors represent the relative weights between the alternatives (BPMN, EPC, RAD and IDEF3).

Computing Consistency Index

Consistency Index (CI) of matrix order n represents the size of the matrix. It can be computed using the formula 2, where $\lambda_{\text{max}}$ is the largest eigenvalue of matrix order n:

\[
CI = \frac{\lambda_{\text{max}} - n}{n - 1}
\] (2)

Computing Consistency Ratio

The Consistency Ratio (CR) compares the consistency index with the Random Consistency Index (RI). It can be computed using formula 3. As shown in Table 3, RI is generated from a sample size of 500 matrices:

\[
CR = \frac{CI}{RI}
\] (3)

<table>
<thead>
<tr>
<th>Intensity</th>
<th>Definition</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Equal importance</td>
<td>Two activities contribute equality to the objective</td>
</tr>
<tr>
<td>3</td>
<td>Moderate importance</td>
<td>Slightly favouring one over another</td>
</tr>
<tr>
<td>5</td>
<td>Strong importance</td>
<td>Strongly favouring one over another</td>
</tr>
</tbody>
</table>
Demonstrated importance | Dominance of one demonstrated in practice
---|---
Extreme importance | Evidence favouring one over another of higher possible order of affirmative
(2, 4, 6, 8) | Intermediate value | When compromise is needed

<table>
<thead>
<tr>
<th>No.</th>
<th>RI</th>
<th>0</th>
<th>0.58</th>
<th>0.9</th>
<th>1.12</th>
<th>1.24</th>
<th>1.32</th>
<th>1.41</th>
<th>1.45</th>
<th>1.49</th>
<th>1.51</th>
</tr>
</thead>
</table>

**Table 2. Saaty’s scale for pair-wise comparisons.**

Reciprocal (1/3, 1/5, 1/7, 1/9) If attribute $i$ has one of the above numbers assigned to it when compared with attribute $j$, then $j$ has the value $1/number$ assigned to it when compared with $i$. More formally if $n_{ij} = x$, then $n_{ji} = 1/x$.

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Support Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Null</td>
<td>Not supported, not documented</td>
</tr>
<tr>
<td>No.</td>
<td>Criterion</td>
<td>BPMN</td>
</tr>
<tr>
<td>-----</td>
<td>----------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>R1</td>
<td>Adoption of CIM</td>
<td>5</td>
</tr>
<tr>
<td>R2</td>
<td>Structure and Behaviour</td>
<td>4</td>
</tr>
<tr>
<td>R3</td>
<td>Business rules</td>
<td>3</td>
</tr>
<tr>
<td>R4</td>
<td>Roles</td>
<td>5</td>
</tr>
<tr>
<td>R5</td>
<td>Objectives and E/S</td>
<td>4</td>
</tr>
<tr>
<td>R6</td>
<td>B2B</td>
<td>5</td>
</tr>
<tr>
<td>R7</td>
<td>Usability</td>
<td>5</td>
</tr>
</tbody>
</table>

**Direct Representation Criteria Avg.:** 4.4 3.4 3.3 2.1 13.2

<table>
<thead>
<tr>
<th>No.</th>
<th>Criterion</th>
<th>BPMN</th>
<th>EPC</th>
<th>RAD</th>
<th>IDEF3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>Methodological support</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>3.5</td>
</tr>
<tr>
<td>A2</td>
<td>Modelling-execution gap</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>A3</td>
<td>Runtime</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2.5</td>
</tr>
<tr>
<td>A4</td>
<td>SOA</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2.25</td>
</tr>
</tbody>
</table>

**Automation Criteria Avg.:** 4.5 2.5 1.5 2.3 2.7

<table>
<thead>
<tr>
<th>No.</th>
<th>Criterion</th>
<th>BPMN</th>
<th>EPC</th>
<th>RAD</th>
<th>IDEF3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1</td>
<td>Support Industrial Consortium</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>E2</td>
<td>Meta-model available</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>E3</td>
<td>Modelling Framework</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2.25</td>
</tr>
<tr>
<td>E4</td>
<td>Open source tools</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>2.5</td>
</tr>
</tbody>
</table>

**Open Standards Avg.:** 5.0 2.3 1.8 2.3 2.85

**Final Ranking** 69 43 36 33 45.25

Table 4. Comparison Scale.

Table 5. Comparative analysis.

7. **Analysis and Results**
We attempted to utilize AHP technique for the selection one of the most appropriate BPM technique that we investigate in this work. We explained the analysis through AHP. Figure 1, presents the hierarchy model for our criteria of selecting BPM technique consisting of 4 levels. Level 0 represents the goal of our study, “selecting the most appropriate BPM technique”. Level 1 consists of 3 main criteria which are Direct Representation, Automation, and Open standards. Level 2 contains the sub-criteria, and the last level is the alternative techniques.

![Figure 3. Final Ranking.](image)

![Figure 4. Ranking of techniques based on main criteria.](image)

Figure 3 presents a radar chart for the final ranking of the alternatives which were BPMN (69) represents the most preferable BPM technique, followed by EPC (43) with a priority vector of (43). RAD gets the third place with priority vector of (36), and finally with priority vector of IDEF3 (33). The table also shows the relative importance
of the main criteria and the sub-criteria. The total of average values of direct representation criteria is (13.2), followed by Open Standards (2.85) and finally, automation criteria with total average of (2.7). In terms of main-criteria. Figure 4 shows that the top values are for BPMN. While EPC and RAD where almost equally in the direct representation criteria and open source standards, finally, IDEF3 have equal ranking for automation and open standards criteria. In terms of sub-criteria and based on table 5, the top values are for the Adoption of CIM criterion with total value (4.75), followed by structure and behaviour (3.75) and Roles (3.25).

Conclusions and Future Work

Due to the existence of different business process modelling techniques that are available, organizations seek for to make informed decisions about the appropriate technique that fits their needs. In this paper, four business process modelling techniques were compared according to three criteria: Direct Representation, Automation and Open Standards. According to our analysis, BPMN represents the best technique compared with the designated criteria, followed by Event-driven Process Chain, then RAD and finally IDEF3. As a future work, we intend to cover more business process modelling techniques, apply it into more general case study, involve a larger number of BPM experts and enhance the comparison criteria.

References


The Chief of Information Offices – performance, skills and job demands

Abstract
This paper presents a research on the relationship between CIO performance and the CIO skills and CIO job demands. The CIO’s literature has many researches about the desirable or expected CIO skills, and few papers about the influence of organizational characteristics on CIO profile. The main contribution of this paper is to analyse the moderator effect of CIO job demands on the relationship between CIO skills and CIO performance. In order to describe this moderator effect, three hypothesis about the dimensions of three concepts are presented. A survey will collect the CIO perceptions about these three concepts. The collected data should be analysed by structural equation modelling.

Keywords: CIO, Chief Information Officer, Competences, Performance, Skills, Job demands

1.0 Introduction
Some Brazilian companies have placed the Chief of Information Officer (CIO) as Chief of Operation Officer. An example of this transformation is Natura, a leading company in the beauty products sector, which has gradually increased the authority of its CIO from the information systems that support the operation to the sales management and, in the last year, to management of the operation. In these companies, information is an important part of products and, crucially, a crucial element of business processes and decision-making processes. Even in companies where the CIO maintains a more traditional and restricted authority, its role is changing because the role of IT is also changing. New IT technologies, such as cloud computing, big data, analytics, machine learning, Internet of Things (IoT), augmented reality, mobile devices and advanced human-machine interfaces, bring opportunities and challenges for businesses. The importance of IT or, at least, the potential importance of IT, tends to increase. Especially because the impacts and uses of these new technologies are not yet completely clear.

The CIO profile has been used as a proxy measure of the organization's IT capacity (Bharadwaj, 2000; Santhanam & Hartington, 2003). In addition, the literature on the CIO profile presents several lists of desired and necessary competences (Earl, 1996; Periasamy and Seow, 1998; Ravarini et al., 2003; Kitzis and Broadbent, 2005). Nevertheless, the lists of CIO competences do not consider characteristics of the company or its contexts. Besides, there is not a clear distinction between the CIO
personal attributes and the duties and responsibilities of the CIO position – CIO job demands.

The exceptions are Sojer et al. (2006) and Peppard et al. (2011) that used qualitative approach to create type of CIO. Sojer et al. (2006) used the Nolan and McFarlan grid to propose four types of CIO, and Peppard et al. (2011) used two dimensions of IT importance to propose a sort of ladder of CIO’s types.

This research analyses the impact of the alignment between CIO skills and CIO job demands on the CIO performance. The contribution of this research is to include the CIO job demands as a moderator construct in the relation between CIO skills and CIO performance. It should improve our understanding about the desirable or expected CIO characteristics, and contribute with processes of CIO selection and development.

2.0 Theoretical Background

The literature review showed two different major groups of works. The first group the papers on the desired, expected or more important CIO skills (Earl, 1996; Periasamy and Seow, 1998; Ravarini et al., 2003, Kitzis and Broadbent, 2005; Lane and Koronios, 2007; Chen and Wu, 2011, Moraes & Galvão, 2017, Silva and Moraes, 2018, Moraes and Kiste, 2018, Moraes et al, 2018a, Moraes et al, 2018b). These papers bring lists of competencies that are sometimes grouped into categories. The differences between these lists of CIO competencies can be explained by several reasons: the use of different approaches (qualitative research and quantitative research), research context (countries and industries), and by the moment in which the research was done. The evolution of information and communication technologies and the importance of IT in companies may have changed the demands of the CIO that would explain some of the differences between studies carried out at different moments. Often these works do not distinguish between the characteristics of the CIO (personal skills) and the demands of the job (roles and responsibilities). They are distinct objects – the person and the position – whose characteristics must be aligned.

Another criticism that can be made of the work of this group is that they did not consider how the organization particularities affect the CIO profile. The second group of research contains the works that present CIO archetypes in function of the role of the IT in the organization (Sojer et al., 2006; Moraes and Galvão, 2018).
Moraes and Galvão (2018) emphasize that the relationship between the characteristics of the company and the profile of the CIO has a double meaning. Previous studies (Sojer et al., 2006; Peppard et al., 2011) had already indicated that the company characteristics affect the CIO profile, but the CIO profile also affects the role of IT in the company and, consequently, the characteristics of the company. Therefore, these two constructs – company characteristics and CIO profile – have a dynamic interdependence relationship. This same observation (double sense relationship) also appears in Haiek et al (2018) who studied on the CIO roles on the Brazilian chemical industry. They concluded that there is now a perception of great potential for innovation through new applications that can handle large volumes of information. This information would be available in new media and formats, such as social networks and equipment installed at points of sale. This is a result of the emergence of new technologies – IoT, Social Media and Big Data, for example – and the CIOs are aware of this. Thus, the CIO would be at the forefront of the business transformation process through new applications based on emerging technologies. Thus, the hypothesis of this study is that the CIO performance is the result of the alignment between the characteristics of the CIO (skills) and the characteristics of the CIO position (job demands). The dependent variable is CIO performance, and the independent variables are characteristics of the person and (CIO skills) the characteristics of the position (CIO job demands). The latter represents (or is a reflection of) the characteristics of the organization.

3.0 Research model

Figure 1 shows the search model. The alignment between the CIO skills and his/her position (CIO job demands) is represented by the CIO job demands moderating effect on the relationship between the CIO skills and CIO performance.
The conceptualization of CIO performance will be the same adopted by Smaltz et al. (2006) e Al-Taie et al (2018). The CIO performance has two dimensions (Figure 2). The first, called Supply side, refers to the operational demands, and it has three roles: Educator, Information steward and Utility provider. The second dimension of the CIO performance, called Demand side, refers to the business demands, and it has three roles, also: Strategist, Relationship architect and Integrator.

The CIO skills will be evaluated through Cheng and Hu (2011) approach (Figure 3). They used two dimension to IT capability: information technology competency and management competency. It has similarities with other researches. Moraes & Kiste (2018, 2018c) splitted the CIOs competences on technical and managerial. The information technology competency has three dimensions: IT Infrastructure, Business application and Business-technology integration. The management competency dimension has three dimensions: Business domain knowledge, Interpersonal skills, and Business practice.

The IT strategic impact grid (Nolan and McFarlan, 2005) is a well know model and very used to describe the impact of IT organization importance on IT management. Sojer et al. (2006) and Moraes and Galvão (2018) used the IT strategic impact grid to
describe how IT organizational characteristics affects the CIO profile. Silva (2019) evaluated the influence of one dimension of Nolan and McFarlan model (need for new information technology) on the CIO profile and did not find any correlation between them. Therefore, the model from Steininger (2018) was used to assess the CIO job demands. Steininger (2018) analysed how IT enables digital entrepreneurship. The CIO importance and his contribution to organization is a result of organization IT importance. In companies where IT has a great importance are similar to digital entrepreneurship since IT is a success key element. His analyse is based on the use of IT in the three pillars of business models: management infrastructure, customer interface and value creation. Therefore, these three pillars will be the dimensions of CIO job demands (Figure 4).

Figure 3. CIO Skills

Figure 4. CIO position characteristics
CIO Skills and CIO performance have both two dimensions and they are conceptually linked each other. Technical competency (CIO skills dimension) is related with supply side CIO roles (CIO performance dimension), as management competency and demand side CIO roles. The moderator effect on these two relation must be also with specific dimension of CIO job demand. Therefore, three hypotheses are made:

H1: The Infrastructure management (CIO job demand dimension) positively moderates the positive relationship between Technical competency (CIO skills dimension) and Supply side CIO roles (CIO performance dimension).

H2: The Customer interface (CIO job demand dimension) positively moderates the positive relationship between Management competency (CIO skills dimension) and Demand side CIO roles (CIO performance dimension).

H3: The Product value creation (CIO job demand dimension) positively moderates the positive relationship between Management competency (CIO skills dimension) and Demand side CIO roles (CIO performance dimension).

4.0 Methodological Approach
This research uses a positivist paradigm and a quantitative approach. A survey with CIOs will be done in order to collect the data. The research population is the Brazilian CIOs. Therefore, a questionnaire will collect the CIO perception about three concepts: CIO performance, CIO skills, and CIO job demands. The CIO performance associated constructs will be measured by scales adapted from Al-Taie et al (2018). The CIO skills associated constructs will be measured by scales adapted from Chen and Wu (2011). All these constructs are reflective constructs.

The constructs associated to CIO job demand are formative and adapted from Steininger (2018). The scales for this constructs should yet be developed or identified. The collected data will be analysed by structural equation modelling (SEM). As the model has formative and reflexive constructs, the moderating effect should be evaluated by two stage approach (Hair et al 2017)

5.0 Anticipated contributions
The paper presents a model to explain the CIO performance by the CIO personal skills and the CIO job demands. This is a conceptual contribution since the literature
has not yet analysed simultaneously these two concepts as predecessors of CIO performance. It integrates previous research (Cheng and Hu, 2011; Smaltz et al., 2006; Moraes and Galvão, 2018) in a bigger and integrated scope model.

It also shed light on the importance of the alignment of these two predecessors. From a practitioner’s point of view, the research can contribute shedding light on the CIO selection process and development competences process.

References

Al-Taie, Moyassar; Lane, Michael; and Cater-Steel, Aileen (2018) An Empirical Assessment of the CIO Role Expectations Instrument Using PLS Path Modelling, Communications of the Association for Information Systems. Vol. 42 , Article 1. DOI: 10.17705/1CAIS.04201


Moraes, R. O., Kiste, G. and Pereira, P. M. S. (2018b) Competências do CIO – análise do perfil dos finalistas do prêmio Executivo de TI do ano, In:
Logic Model Early Stage Evaluation of a European Public Health Data Analytic Framework

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Abstract
The multi-national MIDAS (Meaningful Integration of Data Analytics and Services) project is developing a big data platform to facilitate utilisation of a wide range of health and social care data to enable integration of heterogeneous data sources, providing analytics, forecasting tools and bespoke visualisations of actionable epidemiological data. An evaluation framework starting with a logic model and semi-structured interviews using the principles of realist evaluation was developed working with end users and software developers. Parallel case studies were used to address the requirements of stakeholders at critical time points during the project. The objective was to ensure IT systems development is in line with end user requirements. Overall, the early stage interviews findings indicated the logic model is an effective framework for the evaluation of the project.

Keywords: Data Analytics, Realist Evaluation, Logic Models, Epidemiology, Public Health Information Systems

1.0 Introduction
Health care generates large amounts of data, a proportion of which is stored in some accessible form as usable information, but rather less used to guide practice, planning or policy (Murdoch & Detsky, 2013). Information communications technology (ICT) is a key tool to support this process and to assist with effective decision-making. The need for effective use of data is particularly critical in public health organizations, where it is required to support areas such as epidemiologic surveillance, health outcome assessment, program evaluation and performance measurement, public health planning, and policy analysis (Studnicki et al, 2008).

To take appropriate actions, health policymakers require different kinds of information. To satisfy this need, more flexible health data representation, analysis, querying, and visualization methods (analytic software tools) are desirable (Tilahun et al, 2014). Data analytic tools can support wider and easier access to epidemiological information, which has the potential to increase efficiency, reduce errors, and alter professional roles and responsibilities in a manner, which allows improvement in the delivery of patient care (Fonkych et al, 2005).

End users differ greatly in experience and professional background, yet data analytic tools and other software platforms are seldom designed for a wide range of end users (Ziemkiewicz et al, 2012). A rigorous evaluation of health information systems is of great importance for policy makers and end users (Kaplin et al, 2002). However, there are no gold standard frameworks of evaluation theory and practice (Yen et al, 2017; Rahimi & Vimalrud, 2007). These evaluations are problematic, partly due to the complexity of the health systems, and the challenge of selecting an appropriate evaluation framework (Friedman & Wyatt, 2005; Ammenwerth et al, 2003).

The multi-national MIDAS (Meaningful Integration of Data Analytics & Services) project is developing a big data platform to facilitate utilisation of a wide range of health & social care data. A realist evaluation framework was designed to evaluate the project to ensure the platform tools development is in line with user requirements, utilising a logic model and semi-structured interviews with end users and technical developers. The logic model is utilised to evaluate the outputs, outcomes and impacts of the project in collaboration with the MIDAS project partners, the project policy board, and other
stakeholders to identify potential gaps between framework user’s expectations and requirements of the tools with their actual needs.

2.0 The MIDAS Project

MIDAS project is funded from the European Union 2020 programme. The project is developing a big data platform to facilitate the utilisation of a wide range of health and social care data. The platform will enable the integration of heterogeneous data sources, provide privacy-preserving analytics, forecasting tools and bespoke visualisations of actionable epidemiological data. Sources include anonymised patient data, cohort and epidemiological data nationally and regionally from European health authorities, in addition to individual data collected from apps, sensors and social media to test and develop the tools. This data is uploaded to analytics and visualisation systems, and forecasting tools are being developed to assist end users and policy makers formulating policy decisions, to perform data-driven evaluations of the efficiency and effectiveness of proposed policies in terms of expenditure, delivery, well-being, health and socio-economic inequalities, improving policy risk stratification (Rankin et al., 2017).

3.0 The Case Studies

Four case studies are underway with each region having its own particular health-based interest - Republic of Ireland (Diabetes); Basque Region (Child Obesity); Finland (Preventative mental health and intoxicant use problems of young people); Northern Ireland (Children in care). These case studies commenced in September 2016 (duration 40 months) and will continue throughout the duration of the project.

4.0 The Logic Model

The logic model is a framework for the development of the MIDAS project evaluation plan. A logic model is a representation of how a program is intended to work and links processes, theoretical assumptions and deliverables of the MIDAS project. These relationships are represented as diagrams or flow charts that convey relationships between contextual factors, inputs, processes and outcomes presenting the relationships among resources that are required to operate and plan activities that are expected to be achieved to successfully deliver the programme (Kellogg Foundation., 2004).

The model depicts the logic of translating the technical and programmatic inputs of the integrated information system, including how these inputs produce high-quality activities through liaising with stakeholders. These models force stakeholder serious consideration of desired results over time against expected outputs, outcomes and potential impacts, throughout the duration of the project.

The logic model for MIDAS project was developed based on the grant agreement and project deliverables, circulated to the stakeholders a number of times to get their feedback, and subsequently refined over a period of six months. The final model served as a guide for designing the study protocol and semi-structured interview framework as the basis for the coding, facilitating refinement of themes to aid the development of a clear conceptual framework (Ritchie et al. 2003).
Logic Model Early Stage Evaluation of a European Public Health Data Analytic Framework

5.0 Methodology

5.1 Experimental Design
The current project uses multiple mixed-method evaluation frameworks (Green et al., 1997). Longitudinal semi-structured interviews are performed over the duration of the project. This involves a novel case study design, interviewing both end users and developers in parallel. The data collection process was developed based on the logic model and uses semi-structured interviews, with developers and end users to evaluate health analytic software acceptance use gaps, at critical time points, throughout the duration of the study.

5.2 Semi-Structured Interviews
The initial rounds of interviews with end users, policy makers, and lead developers were performed during the pre-implementation and first testing stage of the MIDAS platform development. The purpose of this evaluation from the perspective of end users is to identify their expectations, feedback and requirements of the software tools for the purpose of formulating and constructing effective public health decision-making policies from regional and national data from each case study. The focus for developers is on their understanding, evolving over time, of end users’ requirements of the software platform. Prior to undertaking the interviews, both stakeholders groups were provided with the general themes of the interview questions in advance to assist them to consider their answers. Two topic guides were developed, one for software developers, and one for end users. Each phase of interviews with both stakeholders groups informs the next round of interviews as a means of identifying gaps between their expectations and utility of the platform. The semi-structured interviews are 30-40 minutes’ duration, are recorded with the consent of stakeholders and transcribed verbatim. On completion of each round of interviews, the stakeholders were provided with a copy of their transcript for review and validation.

5.3 Transcript Coding
The transcript coding was based on the framework approach (based on Ritchie, Spencer, & O’Connor, 2003; Smith & Firth, 2011) to qualitative data analysis guided by the logic model, which will be refined over time as the interviews proceed. The final logic model served as a guide for designing the study protocol and semi-structured interview framework. Interview transcripts were subject to independent double coding to verify their content. The initial coding process involved a preliminary review of the transcripts, highlighting relevant phrases and noting possible codes. These codes were compared and contrasted with the logic model codes to identify common themes relating to logic model deliverables.

6.0 Preliminary Results
The logic model deliverables were classified to gauge project progress and the validity of the model at this stage of the project. Logic model outputs that corresponded with end users and technical developers transcript themes related to the relevance of timely delivery of the project’s components, successful management of governance risks, and project adherence to ethical and governance practices. End users expect the platform framework to be replicable and allow integration of big data for end users to undertake data analytic modelling and achieve the required results from their data to enhance policy decision making.

The logic model outcomes identified through the end user and technical developers transcripts referred to the successful delivery of technical milestones’ corresponding to completion of the first iteration of training and UX testing, completion of key performance indicators for end user requirements and the development of data quality protocols. End users also expressed a wider understanding of the project, which was achieved through workshops. Technical and non-technical white papers created by the technical development teams to capture end user requirements also facilitated end user understanding and project engagement.
At this early stage of the project’s development, stakeholders discussed project impacts less frequently than outputs and outcomes. Impacts discussed by end users and technical developers included completion of the first iteration of training and user experience testing and the potential of these sessions to create actionable insights as the project progresses. Stakeholders also discussed the potential for the MIDAS platform tools to enhance structured decision making, which will facilitate effective health policy decision making. It is anticipated that actionable insights will bridge the gap between the end user’s expectations of the MIDAS platform tools and technical developers understanding of end users requirements.

7.0 Conclusions

At this early stage of the MIDAS project’s development, the logic model signed off by stakeholders (policy board, policy makers, and technical development teams) represents an accurate representation of the project’s key outputs, outcomes and (to a lesser extent) impacts identified through logic model transcripts coding process. The logic model was developed through a number of iterations of consultation with the MIDAS consortium as an initial process of evaluating, planning and developing the project. As the project progresses, key indicators (outputs, outcomes and impacts) that were not initially included in the logic model may be identified through interviews with end users and the technical development teams. To narrow the gap between end user requirements of the platform tools and technical developers’ expectations of the end user needs, an ongoing process of refining the logic model is required at critical stages of the project’s development.

8.0 References


Logic Model Early Stage Evaluation of a European Public Health Data Analytic Framework


Personalized Recommendations on Twitter based on Explicit User Relationship Modelling

Abstract

Information overload is a recent phenomenon caused by a regular use of social media platforms among millions of users. Websites such as Twitter seem to be getting increasingly popular, providing a perfect platform for sharing information which can help in the process of modelling users and recommender system research. This research studies information overload and uses twitter user modelling through making use of explicit relationships amongst various users. This paper presents a novel personal profile mechanism that helps in the provision of more accurate recommendations by filtering overloaded information as it gathered from Twitter data. The presented method takes advantage of user explicit relationships on Twitter based on influence rule in order to gain information which is vital in the building of the personal profile of the user. In order to validate this proposed method's usefulness a simple tweet recommendation service was implemented by using content-based recommender system. This has also been evaluated using an offline evaluation process. Our proposed user profiles are compared against other profiles such as the baseline in order to have the proposed method's effectiveness checked. The experiment is implemented based on an experimental number of users.

Keywords: Recommender systems, User Modelling, User Profiling, Explicit Relationships, Twitter, Influence Score.

1.0 Introduction

Real time web seems to be growing as an innovation or technology through which users communicate and send messages via various means such as Twitter. Twitter is a platform being used by millions of people all around the world. Through this social media platform, users are able to exchange and post messages that are short (up to 280 characters) which are referred to as tweets (Vosoughi, 2015). Twitter has been around for a number of years and it has been proven very effective when it comes to sharing casual information as well as breaking news.

Twitter is possible to consider it as a distinctive form of social media websites that present relationships based on a following strategy, something that makes it different from other classic social networking platforms which is based on reciprocal network like Facebook. Relationships that exist between users of Twitter can be informational or social or both. This is due to the fact that users are always following other users for the primary purpose of getting information that takes active part in a network of both interactions and relationships (Abel, Gao, Houben and Tao, 2011; Vosoughi, 2015).
As explained by Abel et al. (2011), there are studies which show Twitter as a vital resource for lots of approaches similar to recommender systems (RSs). RSs have been considered an integral part of many mobile and web applications, having as a goal to ensure the provision of context-aware, real-time and personalized information. This is to help in the increase in sales and user satisfaction. Many studies have used twitter in modelling users and building user profiles in order to have accurate recommendations delivered. This paper is focusing on a Twitter-user model profile via exploiting their relationships in order to improve the performance of recommender systems based on short-text (tweets) profiles within short-term, recent tweets (within last 2 weeks for instance). The following contributions are delivered:

- We propose a recommendation method that builds user profiles from tweets of user's friends with the influence rule redefined by our model
- The proposed method has been experimentally evaluated using a real dataset and well-known metrics with the recommendations delivered being more accurate when compared to alternative methods used as baselines.

The rest of the paper is organized as follows: Section 2 delivers the related work, section 3 presents the proposed method, section 4 explains the experimental evaluation and section 5 contains the conclusions.

2.0 Related Work

A method was proposed by Lee, Oh, Lim and Choi (2014) which was aimed at ensuring that there is improvement in the recommended news articles' accuracy that are from tweets of Twitter. The user profile got built via the extraction of nouns in tweets as well as retweets of users. It was discovered that recommendations based on Twitter are more accurate than the random or normal recommendations. The TRUPI system was proposed by Elmongui et al. (2015). This combined both social features and also the history of tweets from users. It can also capture the level of dynamism that users demonstrate towards various subject matters. This helped to measure how the interest of users changes over the course of time. Temporal dynamics were analysed by Abel et al. (2011) in Twitter profiles. This is majorly for recommendations that are personalized in the social web. Two different forms of profiles were built. These were based on entities and hashtags (for example celebrities and places). Some variables were taken into account such as user's activity, enrichments (making use of external resources like Wikipedia) and time sensitivity. The result revealed that the profile which is entity-
based that has been built within a very short period of time; and enrichment outperformed other forms of profiles in a system that is news recommended based on the activities of Twitter. Also, lots of users have the problem of not being able to create a profile that is reliable. This is primarily due to insufficient data about their recent activities. Piao and Breslin (2016) were able to demonstrate that making use of a decay function in the case of long-term profiles which tends to give more weight to current topics of interest as compared to older topics (of interest) indicated much better performance in getting recommendations delivered as compared to long-term profiles when there is no decay function. Apart from that, it has been proven before by Abel, Gao, Houben and Tao (2013) that short-term profiles are better than complete profiles. A major solution has been the enriching of user profile through the use of other data. In the work of Abel et al. (2013), authors were able to model user profiles (in Twitter) through the use of various dimensions. They were able to carry out comparisons on each of them. One of such dimensions happens to be enrichment. Results have demonstrated that making use of external resources like news articles is much better than reliance on Twitter.

Enrichment of user profile through the use of data has been done in various ways. These could be making use of textual external resources (like Wikipedia or articles) or exploiting of URLs in tweets. In order to get URLs of tweets exploited, there was the recommendation of a CatStream system in the work of Garcia Esparza, O'Mahony and Smyth (2013). This makes use of the traditional or normal classification method to profile the users of Twitter. It was based primarily on their tweets' URLs. However, the focus of this system was on the URLs of users' tweets. This made it unsuitable for users who do not have enough number of tweets that has URLs. Alonso et al. (2010) categorized some tweets as being uninteresting and interesting through the use of crowdsourcing. This method was able to demonstrate that a URL link's existence is a feature which can be used accurately in selecting tweets that are interesting. However, it has its own shortcoming that there is a possibility for uninteresting tweets which does not have useful content being categorized incorrectly (Karidi, Stavrakas and Vassiliou, 2016). Authors made use of external resources like articles and Wikipedia in the work of Abel et al. (2011) and Garcia Esparza et al., (2013). User profiles that were enriched through the use of external resources outperformed those profiles there were built solely on the activities of Twitter. Methods such as these are very useful when it comes to supplying more details or information to the user profile. This can help to improve the
recommender system's accuracy. However, data which are gotten from external resources will not have any relevance to the interest of users. This may likely affect the recommender system's performance in an adverse way. Furthermore, most users do not usually provide adequate URL links during their tweets.

There is a field which is yet to be investigated. This is exploiting the network of relationships which exists amongst Twitter users with the aim of having a specific user characterized and improving the recommender system's performance. This will be based on activities which are of short-text. It is clear that any user who is into the generation of short-term data (retweets and tweets) can possibly get categorized. This will be based on his behaviour by having historical data collected (that is timeline) which the user has generated by himself. However, for sufficient details to be acquired for the purpose of profiling, a method such as this may need to dig into the past. The gathered information may not be current though. There is also the problem of many users not having adequate data as well as URLs in their most recent activities through which a reliable profile can be created. For this problem of inadequate data to be addressed, we suggest the use of explicit links (for instance, following links) amongst users. This will help in getting relevant recent activities expanded. This method has an advantage which is the fact that there will be more recent data through which profiles can be built from. Through this, the performance of recommender system which is based on short-text messages will improve.

Having following links exploited is going to be achieved via searching for influential users in friends list. Calling a user as an influencer, his actions needs to be effective on users within the same network. Precisely, influencers are users who able to spread information through a network (Morone and Makse, 2015). Majority of the researches were focusing on the popularity of users based on their number of followers (indegree) and friends, and also how they interact with various users (Anger and Kittl, 2011; Bakshy et al., 2011; Chen et al., 2014). TwitterRank was proposed by Weng et al. (2010) to measure the users influence which is an updated version of Page Rank. Other researchers analyzed other measures such as retweets and mentions alongside with indegree to find influential users within a network (Romero et al., 2011). Riquelme and González-Cantergiani (2016) were able to collect and classify various twitter influence measures. However, it is believed that there are variations in the influential rule amongst users in the friends' list. Also, they stated that there is not any agreement with regards to what an influential user should be. Thus, there should be the need for a
method, which can have influence score generated from the perspective of users, to be created. This is in relation to the interactions and behaviour of users. Once the influence score has been identified, there is need for incoming tweets to be classified into various categories such as relevant and irrelevant. Techniques have been proposed by researchers for the prediction of tweets which will likely be retweeted. This will be dependent on those features that are content-based (Naveed et al., 2011), coordinate ascent (CA) algorithm (Uysal and Croft, 2011) and collaborative tweet ranking (CTR) (Chen et al., 2012).

3.0 Proposed Method

Generally, the recommender system consists of two stages: user profiling and item ranking. User profiles are going to be built in this work via the extraction of information from those tweets in the timeline of the user and tweets by his/her following list. User profile seems to be what recommendation items are being ranked upon. The whole process will be displayed by Figure 1. Through the use of Twitter API, user's information will be collected. These details or information will be processed in order to identify those keywords that are important which have been posted by friends of the user. The steps which are involved in both stages will be explained in the subsections below.

![Figure 1. The general steps of the proposed method.](image-url)
3.1 User Profiling Stage

This stage involves the development of user profiles which contain vital details regarding the user. These are profiles which are built from other users' tweets (friends) who are directly related to the Twitter user. Every profile is being built as keyword profile. Pre-processing steps will have to be implemented prior to the process of recommendation. This will be based on those steps which Micarelli and Sciarrone (2004) suggested. The aim of this is to ensure that tweets are filtered in order for important contents to be extracted. Tweets which the user generates on his own and also retweeted indicate his interest. However, tweets that are received (incoming tweets) from links which are explicit will need to be evaluated and classified. The following steps explain how this stage works:

Step1: Before the profiles are being built, data about the user will be collected from his Twitter timeline. This includes favourited tweets, timeline tweets and friends list.

Step2: This is when influence score can be computed between users and their friends in order to enable us to get such friends ranked based on their level of importance. We will also be able to collect contents that are appropriate. Influence score takes certain variables into consideration such as favouriting, replying, re-tweeting and following. It can be very useful in looking for friends that are important to the user. Influential friends are actually found through the use of the influential score from the perspective of the user. By applying equation 1, the influence score is computed.

\[
\text{Influence Score}(u_1, u_2) = \frac{(\sum \text{RTs}(u_2) + \sum \text{RTs}(u_2) + \sum \text{MT}(u_2) + \sum \text{FV}(u_2))}{(\sum \text{RTs}(p(u_1)) + \sum \text{Ts}(p(u_2)) + \sum \text{MT}(p(u_1)) + \sum \text{FV}(p(u_1)))} \times \frac{1}{4} \tag{1}
\]

In equation 1, user1 (u1) represents the original user while user2 (u2) represents the followed friend. \(\sum \text{RTs}(u_2)\) is the total number of tweets posted by user2 and re-tweeted by user1. \(\sum \text{RTs}(p(u_1))\) is the total number of re-tweets in the user1 profile. \(\sum \text{Ts}(p(u_2))\) represents the number of tweets in the user2 profile. The number of replies (mentions) that user1 posted to user2 represented by \(\sum \text{MT}(u_2)\). \(\sum \text{MT}(p(u_1))\) is the total number of mentions in user1's profile. The total number of tweets from user2 that user1 has favourited is represented by \(\sum \text{FV}(u_2)\). The total number of favourited tweets in user1's
profile is presented by $\sum FV p(u_1)$. Finally, $1/4$ is used to normalize the score between 0 and 1.

**Step3:** Friends list will be grouped into 3 parts based on influence score, which are non-influential friends, less influential friends and influential friends using K-means clustering algorithm. After that, tweets will be collected from all the three groups.

**Step4:** Every tweet which has its origin from the influential group will be added to the user profile while those tweets which have their origins from the non-influential group will not be added. Those tweets which have their origins from less influential friends will be classified as re-tweetable (representative) or not re-tweetable (not representative). This process made use of various classifiers: Neural Networks, K-Nearest Neighbor, Decision Tree, Support Vector Machine, Random Forest, and Naïve Bayes. Every classifier is trained through the use of a labelled data set which is from the timeline of the user and also non-influential users' tweets. Those tweets which have their origins from the user timeline will be tagged as re-tweetable (representatives) while those from non-influential users are going to be tagged as not re-tweetable (not representative).

**Step5:** The dataset is divided into two parts, which are testing and training sets. Testing sets is used in the computation of every classifier's accuracy. Any classifier that is the highest in terms of accuracy is going to be automatically chosen in order to get the tweets of less influential users classified. This step is to ensure that tweets are classified through the classifier which is the most accurate. After getting the tweets of less influential users classified, those tweets which have been classified as re-tweetable (representative) will be stored in the profile of the user alongside influencers' tweets.

### 3.2 Items Ranking Stage

During this stage, recommendation items are a group of tweets which the user is going to indicate interest in by the retweet action. Vector space model representation is used in this process and user profile as well as recommendation items will be considered as vectors. The angles that are between them will be computed. Once an item is very close to the user profile, such is a sign that it is relevant. The closer it is, the more relevant it will become. In order for the angles to be calculated, the cosine similarity is defined in
equation 1 and applied. In cosine, the distance between to point A and B is calculated and the values range from -1, total dissimilarity and 1 total similarity.

\[
similarity = \cos(\theta) = \frac{A \cdot B}{||A|| \cdot ||B||} = \frac{\sum_{i=1}^{n} A_i B_i}{\sqrt{\sum_{i=1}^{n} A_i^2} \cdot \sqrt{\sum_{i=1}^{n} B_i^2}}
\]  

(2)

The user profiles have been built as explained in the last subsection. It will function as the basis through which the group of tweets inside the recommendation items are ranked. All the tweets inside the recommendation items are going to be evaluated or ranked based on how they are similar to the user profile. Before the cosine similarity applied, pre-processing steps are applied that are suggested by Micarelli and Sciarrone (2004). Furthermore, tweets are going to be excluded when the text that is remaining is less than 3 words. Lastly, there will be computation of the similarity score between user profile and tweet profile. Cosine similarity equation is what this calculation will be based on. Therefore, every recommendation item is ranked. Also, top-k tweets will be recommended to such user.

4.0 Experimental evaluation

In order for the advantage of this proposed method to be validated, there was the implementation of tweets recommender system. An evaluation was also performed offline using some set of users. Through the use of Twitter API which can be found inside the development section of the official website of Twitter, some randomly chosen users' (29) timelines were collected as well examined. In the case of recommendation items, those test tweets which users had indicated some levels of interest before through re-tweets are collected from timelines of users. The following subsection will be explaining the methods through which these tweets are collected.

4.1 Experiment Setup

Once the examined user's timeline has been collected and prior to getting the influence score computed, as well as getting users clustered into the 3 main groups, the dataset has been divided as shown in Figure 2. It has been broken down into 3-time frames.
Dividing the user timeline into three evaluation time frames.

The first-time frame's tweets are made use of as test item. It is clear that they were retweeted simply because the user was interested in them. This is similar to traveling into the past in order to predict the future which is known already. This can help in the process of evaluation. The second time frame's tweets (between 1 week and 3 weeks ago) will be used in getting user profile built from various sources. The third time frame is going to be used alongside the second time frame in order for the influence score to be computed from the examined user's timeline. Furthermore, the timeline of the user will be used during machine learning classification.

Profiles: For each user of the 29 users, some profiles are made and then compared against each other and against the baseline. This is to ensure which profile performance is the best in order to compare it later against other metrics such as similarity, distance and indegree. The profiles are explained below:

1. **Baseline**: This includes all the tweets on the timeline of the user. It contains tweets that have been posted and also those which are re-tweeted.
2. **BL.Cinf**: This includes every tweet from the timeline of the user, short term tweets of friends that are influential and also those ones from less influential friends which have been classified as representative.
3. **STBLCinf**: This includes only those second time period's tweets (short term) and also those from the timeline of the user. It also includes every tweet by influential and less influential friends which are classified as representative.

4. **STBLInf**: These are only second period's tweets. They include tweets from the timeline of the user, by influential friends and also less influential friends. Classification is not given any consideration.

5. **BLinf**: This is every tweet from the timeline of the user, short term tweets made by less influential and influential friends. This profile does not consider less influential friends' tweets classification.

**Test tweets**: Test tweets are being used in evaluating the recommender system's accuracy. These are a group of tweets that are gotten from the first-time frame (week 1). The recommender system makes use of them as recommendation items. It is a collection which contains tweets that are relevant and irrelevant. From the user's timeline, those items that are considered to be relevant which he has retweeted will be known. Irrelevant items are tweets collected from friends and the user has not shown any action to them. Therefore, recommendation items are a combination of both items that are relevant and irrelevant. This will help to ensure that the accuracy is measured by the recommender system when it runs different user profiles. It will also enable the built profiles and the baseline profiles to be compared.

**Evaluation metrics**: This study made use of offline evaluation in measuring the recommender system's accuracy through the use of various user profiles (Uysal and Croft, 2011). Various user profiles were used in the recommender system and then they are compared. This research made use of the metrics in measuring the accuracy of the system's performance, which are average of precision @ k (P@k), average precision (AP) and mean average precision (MAP). P@k is the amount of correct recommendations in the top-n list of recommendations and is defined in equation 3. AP is defined in equation 4 where p(k) is the precision @ k and rel (k) is an indicator counting as one if the item is relevant or zero otherwise. Moreover, relevant not retrieved items receive a score of zero. Lastly, MAP which is defined in equation 5 with Q being a query and the equation returning the mean of the average precision scores for a set of queries.
\[ P@k = \frac{\text{relevant recommended items}}{\text{total recommender items}} \]  

(3)

\[ AP = \frac{\sum_{k=1}^{n}(p(k) \times \text{rel}(k))}{\text{number of relevant recommendations}} \]  

(4)

\[ MAP = \frac{\sum_{q=1}^{Q} AP(q)}{Q} \]  

(5)

Through the AP, the system will be measured in terms of how good it is at retrieving top-k relevant items. The MAP measures the effectiveness of the system in getting all relevant items retrieved.

### 4.2 Results

This subsection explains the results obtained from the evaluation metrics. In the metric of the Average of Precision @top-k recommendations, the tested values of k are: 1, 3, 5, 10, 15 and 20. (See Figure 3).

![Figure 3. The average precision @1, 3, 5, 10, 15 and 20 of profiles.](image)

When the top-k is set to 1, 3 and 5, results showed that the profile STBLCinf scored the highest average precision among all other strategies of building user profiles. It contains the short-term tweets of: user timeline posts, influential friend tweets and less influential friend tweets that are classified as relative. This strategy shows how powerful the profile is to give relative recommendations on top of the recommendation
list to users. Otherwise, the baseline and BLCinf profiles scored the lowest average precision on top-1. The baseline outperformed all other profiles when the top-k is set to 10. The STBLCinf profile came in the second place whereas STBLinf achieved the lowest Average Precision. Continuously, Profile STBLCinf outperformed all other profiles in top-k = 15 and 20. However, again profile STBLinf achieved the lowest average precision and that might give a clear view that non-relevant tweets affected the accuracy of the recommender system. STBLCinf and STBLinf were built similarly but the only difference is that the latter included all tweets from less influential users without any consideration of classification. As a result, this small difference can affect the performance and make it achieve the lowest reliable profile.

In the Mean Average Precision (MAP), Figure 4 shows the results that the profile STBLCinf achieved the highest mean average precision against all profiles. Also, profile BLCinf achieved better performance than the baseline and that might mean enriching the baseline profiles with some related data can improve the performance of the recommender system. Also, profile BLinf was built similarly to BLCinf achieved less MAP than the latter and the baseline profile. This may clarify that enhancing profile with none related data (unclassified tweets in this case) can reduce the quality of delivering recommendations even worse than the baseline. Also building profiles based only on timeline (baseline) cannot deliver more relevant recommendations. On the other hand, profile STBLinf achieved the lowest MAP.

To validate how strong our proposed influence score that the profile STBLCinf built based on, we compare the profile against other 5 profiles, which are based on similarity,
distance and followers count. The similarity metrics are: Cosine and Jaccard. Euclidean and Manhattan distances are also used. Finally, followers count metric is used to build a profile and the reason is that there are literature researches that have used this during experiments as a sign of influence (Cha et al., 2010; Bakshy et al., 2011; Razis and Anagnostopoulos, 2014; Riquelme and González-Cantergiani, 2016). We built the mentioned profiles in the same way of the profile STBLCinf. Additionally, the clustering was applied based on the mentioned metrics instead of the influence score. In the results, the profile STBLCinf outperformed all other profiles in Average precision @3, 5, 15 and @20 as in Figure 5. Whereas, it achieved the same average precision @1 with Jaccard profile. Euclidean profile outperformed all other profiles when the average precision is set to 10. Also, it came in the second place in AP@3, 5, 15 and 20.

![Figure 5. The average precision (AP) @1, 3, 5, 10, 15 and 20 of profiles.](image)

Results in figure 6 also showed that in the Mean Average Precision, the profiles STBLCinf and Euclidean achieved the highest MAP among all other profiles. Surprisingly, the followers count profile achieved the lowest MAP and this might clarify that the number of followers is not a reliable metric to measure how influential a user is. Also, this prove our hypothesis about the influence rule has to be based on the user preferences and not on the influencer himself.
5.0 Conclusion

In conclusion, a new method through which user's profiles can be built via exploiting Twitter explicit network structure. This is to ensure that the short-text-based recommender systems' performance is improved by a better way of modelling user. The new user profile takes advantage of following links between users as well as their friends in order to gather short-term tweets. Through these tweets, profiles were built. The Twitter's influence rule has also been redefined. This has helped us in having the following list clustered into 3 groups: non-influential, less influential and influential. Due to this, the tweets of influential users are stored to user profile. On the other hand, tweets of non-influential users are excluded. In order for the representative tweets to be stored into the use's profiles, less influential users' tweets have been classified by classifiers. This method's advantage has been validated through an evaluation which was carried out offline. A prototype tweets-recommender system is what this was based on. Our method's discriminative power is presented through testing as well as making comparison of our method against baseline and followers count profiles. Also, the proposed profile was compared against other similarity metrics such as Cosine, Jaccard, Euclidean and Manhattan. Various forms of relationships will be explored in future between users and their friends. Another thing that will need to be considered is the similarity existing between users and their followers. This will enable us to expand those group of tweets which indicate the interest of the user.

References


New Business Model: Electronic Word-of-Mouth Platforms Improvements in E-commerce Platforms

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Abstract

Electronic commerce (e-commerce) is an emerging field that applies technology in commerce. One of the concepts used in electronic commerce is an electronic word of mouth "EWOM". Technically, the concept is used to evaluate electronic commerce platforms, services/products, and behaviours. Sometimes EWOM is used as a government initiative to sensitize the citizens. The goal of this research is to improve the methods and activities used in Electronic word of mouth platforms for evaluating e-commerce platforms. Therefore, this research: 1) proposes a framework for Electronic word of mouth; 2) chooses "MAROOF.SA" as the system to be improved by the new EWOM business model based on the proposed framework; 3) verifies the new EWOM business model through two justifications plans: an experiment and survey. The proposed framework was derived from "Starbucks experiment of using electronic commerce", which highlighted three main elements that can be used in the proposed framework. In this paper, co-creations value, usability and payment methods were the three elements considered when improving the working of the MAROOF EWOM Platform.

Keywords: E-business, E-commerce, EWOM, Social Commerce, Information Systems, Computer Sciences

1.0 INTRODUCTION

The development of web 2.0 technology has continued to generate new avenues of interactions within users’ technologies and applications. Such avenues include social forums, blogs, reviews, ratings, and communications channels. With this development, new concepts have emerged in the field of information systems. These are social commerce and electronic word of mouth "EWOM", which have new features and capabilities for the audience in order to provide new models of electronic commerce (O'Reilly, 2005; James et al., 2009). Indeed, word of mouth already exists
in economic and commerce fields, and refers to the oral or written communications between customers about specific commodities or sales brands (Lang et al., 2013).

EWOM is a subset of social commerce that is based on social support, interactions and structure. Moreover, it can also be considered as a combination of social media channels and platforms with electronic commerce. However, some researchers consider EWOM as an evolutionary case of electronic commerce that includes social interactions and support, which combine to improve product or services (Stephen et al., 2013). Considering an example, a traditional customer shopping alone will have a very different experience compared to the one shopping with friends. This is due to the fact that shopping with friends may influence the shopper’s decision in choosing different products. The same case applies to electronic commerce and social commerce situations.

One of the main challenges in social commerce is gaining trust and its perspectives. For instance, it is challenging to gain trust with consumers, trust with platforms and trust with the social commerce activities. Many individuals build trust in electronic commerce or social commerce depending on their subjective norms. The subjective norms accumulate through the history of experiments that are related to the customers and those of others. A number of recent studies have delved on the subject of trust in order to improve the performance of social commerce (Farivar, 2017). Many researchers have tried to investigate social commerce perspectives and often, they have focused on the relationship between trust and intentions to buy from the customers’ perspective. Other researches focus on a specific factor of social commerce. For instance, they investigate the effect of co-creation value using trust to support the intention to buy (Pappas, 2017; Wang, 2014) or even usability in social commerce and payment methods used in electronic commerce. However, few research endeavours have worked on utilization of social commerce such as electronic word of mouth. Besides, there is no much research that studies the practices of successful experiments of brands and companies that have converted to social commerce or electronic commerce in order to improve their outcomes.

Electronic word of mouth platform refer to any platform that provide exposing information about products or e-commerce behaviour. Social media platforms consider as EWOM platform and e-commerce platform include feedbacks or
evaluation the interactions between their clients and other selling companies. Such as Booking.com, they consider e-commerce platform (selling and buying) and EWOM platform in the same time. There are platforms only their role are provide information about e-commerce platforms that interact with the audience such as TripAdvisor, Trivago, Hotelscombined and MAROOF. Our theory is to develop these platforms and promote the work for them in order to provide a credit evaluation.

The intention of this research is to get a business model that can improve EWOM platforms, whose success will be evaluated based on the three main elements that define the success of firms when they are converting to electronic commerce (usability, payments and co-creation value). The three constructs have been derived from experiments of the global company, Starbucks, which has undertaken conversion to digitization in order to improve its reputation and outcomes.

As depicted above, this study is aiming to innovate a new way of operations in EWOM platforms. This will lead to increasing trust in electronic commerce and social commerce, and this new innovation will be more effective compared than primitive methods followed currently in EWOM platforms.

The case study of Starbucks and the scholarly papers reviewed describe the relationships between social commerce and other economic concepts. Such insights were very useful when determining the hypotheses in this research. The proposed framework for the hypothesis was based on the insights provided by the Social cognitive theory proposed by (Bandura, 1986). The empirical model of this research shows the relationships between the constructs of successful digital conversions to electronic commerce and how to employ them to be useful in EWOM business model. The ultimate goal will be to increase trust in Social Commerce.

One of the EWOM images is the "MAROOF.SA Saudi EWOM platform". The proposed framework is built through the hypothesis created in the literature review. Therefore, there are three research questions raised:

**Q1. What are the constructs of successful digital conversions to electronic/social commerce?**

**Q2. How are constructs applied through an EWOM framework?**

**Q3. What are the practical implications of applying the new business model in MAROOF.SA Saudi EWOM platform?**
2.0 RESEARCH METHODOLOGY

The goal of this paper is to find methods to improve EWOM platforms in Social commerce Communities. The flow of the research starts with successful case of Starbuck organization when they attempt to convert using a digital commerce. The case extract three components lead to success in electronic/social commerce which are (co-creation value, usability and payment methods). In this paper, we proposed a hypothetical framework (e.g. framework depend on hypothesises) build by social cognitive theory proposed by (Bandura, 1986). The framework parts have been created depend on the results of the literature reviews which mean every part in framework is relate on another part see section 2.0.

Subjective norms lead to intention to pay in social electronic commerce platforms. Usability, co-creations value and payment methods are related on consistent EWOM platforms. Consistent EWOM platform and intention to pay consider the roles of social commerce Growth. Through, framework creating the three constructs. We found that each construct needs a norm which means approach to be assessment. For instance, payment methods, we can not compare social platform depend only on cash delivery against platform support all methods of pay such as (cash delivery, deposit, digital concurrencies etc.). Survey and experiment laboratory were both created to provide a result support the theory. First, laboratory experiment is prototype follow the theoretical framework. The prototype is improved "MAROOF:sa" examined on a group of participants. We performed a survey questions (see Appendix A) to gathered more data to applied on the study.

3.0 LITERATURE REVIEW

At present, the business model is still a relatively new concept, which has been introduced in the market during the last decades of the 20th century. Along with the effectiveness in businesses, it continues to receive more and more attention from the field of scientific research. As a result, many business model aspects such as characterization, its practical insights and useful perspectives are proposed and put into practice. However, there is no unique definition of the business model. For the traditional business system, the business model is the result of implementation of the traditional business analytical process. This section is an interrelated literature, reviews information regarding the scientific inventory of electronic commerce and
social commerce. In general, the goal is to discover the viewpoints of researchers and practitioners in the fields of economics and information systems, regarding the specific inferences of the previous opening case of Starbucks digital conversions. The literature follows the categorizing methods used in literature reviews, which means that the section will provide descriptions of the related concepts to identify the proposed framework. Therefore, a schedule of literature investigations about the topics that serves the proposed framework will be done. The literature will be focused on two scientific fields (economics field “concepts and initiatives" and information systems world).

<table>
<thead>
<tr>
<th>Literature Topic</th>
<th>Numbers of References</th>
<th>Related Fields</th>
</tr>
</thead>
<tbody>
<tr>
<td>The electronic and social commerce growth</td>
<td>2/I</td>
<td>1</td>
</tr>
<tr>
<td>Government Role in E commerce and Social</td>
<td>3/I</td>
<td>1</td>
</tr>
<tr>
<td>Commerce Growth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The role &quot;Trust&quot; of the social commerce and electronic commerce</td>
<td>6/I</td>
<td>1</td>
</tr>
<tr>
<td>Economic initiatives</td>
<td>4/E – 1/I</td>
<td>1 &amp; 2</td>
</tr>
<tr>
<td>Electronic Word of Mouth</td>
<td>3/E-8/I</td>
<td>1 &amp; 2</td>
</tr>
<tr>
<td>Co-creation value</td>
<td>2/E-8/I</td>
<td>1 &amp; 2</td>
</tr>
<tr>
<td>Enhancement usage (Usability)</td>
<td>3/I</td>
<td>1</td>
</tr>
<tr>
<td>Payment gateways and shopping Carts (Social Shopping)</td>
<td>7/I</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 1. The establishment of research literature reviews. IS (information Systems field) =1, Economic Field= 2, (number of references = N/I (reference in IS) =N/E (reference in Economic)

The genesis of the discussion is the open case mentioned in (Turban, 2016) about the Starbucks, a leading coffee company, which is applying a business plan to convert to e-commerce. The solution for the company was "going digital and social". We extracted three main elements from the case that led Starbucks to a successful implementation of e-commerce. The elements are: 1- co-creations value; 2- usability and 3-payment methods.

Co-creation value is an economic strategy that focuses on customers’ engagement to produce the value of cooperation in products creation. The goal of the strategy is
customer satisfaction by engaging them in decisions of their own products or services (Prahalad et al., 2004).

The process of co-creation value is varied and depends on company confidence, honesty and commitment in meeting the customers’ requirements. The difficulty in co-creation value lies in customers’ regularity and expertise (Ramaswamy, 2009). Social Commerce has three constructs represented as characteristics of the co-creation’s architecture. The three constructs are: behaviour alignment, empowerment, and control. The three constructs are integrated to achieve the structure of co-creation value in social commerce activities (Pappas et al., 2017).

**H1: The Ability of Customers Engagement in designing the products of certain firm through EWOM Platform.**

One of the major areas that research has focused on in the field of social commerce is the use of social commerce platform. Usability in social commerce is considered one of the main drivers to effective social activities. Usability, derived from human-computer interaction, refers to the design of social commerce transactions and the ability to use by the consumers (e.g. understandable, acceptable for all types of audience and compatible). Technically, usability has a number of factors that contribute to the use of any computer information system. One of the most popular factors or usability test is Heuristic Evaluations (Sivaji et al., 2011). This factor is used on e-commerce sites to test the impact of the traditional usability evaluations (Heuristic Evaluations consist of social usability factors which are social presence, social networking, trust, and offline/online communications). The results of previous studies using the evaluation suggest that more usability awareness leads to more social interactions and acceptance. The important construct in social commerce usability is mobile usage, since social commerce fits the mobile device lifestyle perfectly (Turban, 2012; Liang, 2012).

The factor "usability" in the proposed model consisted a combination of traditional heuristic evaluations of usability and new constructs used in many social commerce platforms. Usability will be divided into four sub factors: languages support, Mobility, compatibility, and accessibility (usability for disabilities) (Hajli et al., 2011).
H2: Usability in e-commerce platforms is playing necessarily role to ensure customers usage.

The last element of the proposed framework is the methods of payment, which refers to the transactions between sellers and buyers in an acceptable way in social/electronic commerce platforms. Typical payment methods used in the modern business context include cash, checks, credit or debit cards, money orders, bank transfers, and online payment services such as PayPal.

Any electronic/social commerce platform uses a given method of payment to receive money from customers. The issue however is whether the customers will accept the method of pay or not. In other words, some customer not able to pay by the third party (e.g. visa or MasterCard). Moreover, it may be a cost to the platform preparing a secure environment to use a given method of payment (e.g. secure protocols in pages of payments) (Bai et al., 2015; Amblee et al., 2017). One of the reasons for not accepting third party payment is the culture of the community. For instance, in Saudi Arabia, the third-party payment is not popular because citizens prefer local third parties, for instance, SADAD, which may be more popular than Global payment companies (Alghamdi et al., 2017).

Cash delivery is the most effective payment system from the customer’s perspective. However, online retailers found it not preferable mostly due to the fact that they cannot establish whether the customer is serious or not. The solution for the retailer point is creating a waiting list, though it is unacceptable for some products that need preparation (e.g. Products such as Foods, Plates etc.) (Alghamdi et al., 2017).

E-Cart is a method of gathering the products and obtaining a calculated total price, which reduces time and efforts. Thus, it also reduces the transaction packets and ensures a better decision is made. Moreover, E-cart provides opportunities in social commerce platform to concentrate on social interactions (Turban et al., 2016).

The advantage of using the previous methods in the customers' payment options is to increase trust and purchase intentions. Therefore, a successful platform should provide more than one option to pay. The choices of the methods of payment in the platform affect the efficiency, availability and the governance of the social commerce transactions.
H3: The payment methods staffing is important to the customers of e commerce platforms.

In section 4.0, the proposed framework will be created in line with insights from literature.

4.0 PROPOSED FRAMEWORK

The proposed framework is founded on the social cognitive theory (a theory proposed by (Bandura, 1986). The primary objective of this framework is to gather between the constructs used in digital conversion to social/ electronic commerce and employ it to measure the business model of EWOM for the electronic/social commerce platforms.

The proposed framework describes the customer behaviour of using social commerce platforms. It is hypothesized that when the customer has the intention to buy through social commerce "H1", subjective norms must be there that are owned and accepted through personal conditions. For instance (a friend suggests buying from that platform, or he convinces one to make a purchase by the platform marketing). Otherwise, a customer requires a consistent EWOM platform "H1" which could be achieved by engaging the successful elements of e-commerce platforms (H1 co-creation value, H2: usability and H3: payment methods) into the evaluations of EWOM platform to social commerce platforms and their activities.

Figure 1. The proposed framework for building EWOM business model depend on the hypotheses of the interrelated literature.
5.0 NEW BUSINESS MODEL ARCHITECTURE

After establishing the proposed framework of EWOM platform, we will be designing the activities of the new business model. The business model acts as a map that shows how the elements of the proposed framework will be used. Table 2 describes the evaluation rate for each element of the proposed framework in the new business model. In addition, the algorithm in Figure 2 describes the sequences of business model once the elements of the proposed framework have been designed. We attempted to find mechanism or approach “Privileges” help us to build a simulated prototype for EWOM platform which is MAROOF.

Privileges are providing as approaches or standard to evaluate e-commerce platforms. Without privileges, we can not find a way to evaluate and apply our new proposed framework. Therefore, the privileges divided into the main part of the consistent EWOM platform in the framework. The privileges were existing in the original MAROOF. However, with primitive methods they follow, we developed our privileges as in Table 2 where we consider them as structure for building the prototype.

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Number of privileges</th>
<th>Privileges used in Construct</th>
<th>Privileges Rating</th>
<th>Assessment Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usability</td>
<td>4</td>
<td>Languages</td>
<td>10%</td>
<td>40%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mobility</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Compatibility</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Accessibility</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>Co-creation Value</td>
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<td>Behavioural Alignment</td>
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<td>20%</td>
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<td></td>
<td></td>
<td>Empowerment</td>
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<td></td>
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<td></td>
<td>E-cart</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Rewards System</td>
<td>10%</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. The rate for each element of the proposed framework will be used in new business model of EWOM
**Algorithm 1: EWOM elements in business model**

```plaintext
1: function Evaluate(E-store):
2:     int usability_Evaluation_count = 0; // the part of usability methods evaluations
3:     if (usability-language = "URL_Supported") // more than one language
4:         usability_Evaluation_count ++;
5:     else: return usability_Evaluation_count;
6:     if (usability-Mobility = "URL_Supported") // support mobile, Tables, Smartphones
7:         usability_Evaluation_count ++;
8:     else: return usability_Evaluation_count;
9:     if (usability-accessibility = "Fetch_admin_approve") // support use of access for disables
10:        usability_Evaluation_count ++;
11:     else: return usability_Evaluation_count;
12:     if (usability-compatibility = "Fetch_admin_rate") // compatibility of images and files with e-store
13:        usability_Evaluation_count ++;
14:     else: return usability_Evaluation_count;
15:     int payments_Evaluation_count = 1; // the part of payment methods evaluations
16:     if (third-party = Fetch_admin_approve) // approve by the admins of platform of third-party
17:        payments_Evaluation_count +0.8;
18:     else: return payments_Evaluation_count;
19:     if (digital-currencies = Fetch_admin_approve)
20:        payments_Evaluation_count +0.4;
21:     else: return payments_Evaluation_count;
22:     if (E-cart = URL-supported)
23:        payments_Evaluation_count +0.8;
24:     else: return payments_Evaluation_count;
25:     if (Reward-system = URL-supported)
26:        payments_Evaluation_count +0.8;
27:     else: return payments_Evaluation_count;
28:     if (behavioural-alignment = URL-supported) // suggestions & complaints systems for the e store
29:        co-creation-value-Evaluation_count = 0;
30:     else: return co-creation-value-Evaluation_count;
31:     if (empowerment = Fetch_admin_rate) // defined by admin rates of e-store products and services
32:        co-creation-value-Evaluation_count +0.5;
33:     else: return co-creation-value-Evaluation_count;
34:     if (control = Fetch_customer_rate) // define by customers rates of e-store products and services
35:        co-creation-value-Evaluation_count +0.5;
36:     else: return co-creation-value-Evaluation_count;
37:     int total_Evaluation_Estore = usability_Evaluation_count + payments_Evaluation_count +
38:        co-creation-value-Evaluation_count; 40: Total-rate = Evaluate(E-store);
```

**Figure 2. Algorithm of evaluation e commerce platform in the new business model of EWOM**
The algorithm is considered as a guide to creating EWOM platforms to ensuring that all parts of the framework such as "co-creation value, usability and payment methods" providing its benefit to improve the e-commerce platforms. To enhance the evaluations of e-store and e-commerce platforms, our developed algorithm can help significantly to lead increasing the results of the evaluations. The algorithm was justified through the prototype simulating the EWOM platform "MAROOF". The proposed prototype was built through this algorithm and it is processed. Therefore, the responses of the laboratory experiment that we built through the prototype, we were able to justify the enhancement of the developed algorithm.

The algorithm presents the practical implementation of the proposed framework. The main goal of the algorithm is to guide the electronic word of mouth platforms to build their own platforms according to the new idea. Explaining the developed algorithm, firstly, we open function to evaluate the e-stores. Inside the first function, there is a variable called usability with a default value "0". Then an "if statement " of evaluating usability with two conditions. Through the conditions, first if the e-store has more than one language and these conditions approve through URL page, then the variable will be added value for the evaluation. The second condition if there is no URL page for the language, and then it will return to 0 values as mentioned in Figure 2. The methods of evaluations applied to examine the usability to support mobility, accessibility, and compatibility. This approach repeated to all the three elements co-creation value and payment methods.

6.0 PROTOTYPE OF THE NEW BUSINESS MODEL

The term "MAROOF" is derived from the Arab language word and it means "Known: For a clear understanding by the readers, "MAROOF" is an economic/Social initiative that can be considered to be an electronic word of mouth platform. It is governed and administered by the ministry of commerce and industry of Saudi Arabia that is responsible for e-commerce governance to identify and expose the e-commerce transactions and activities in the scope of Saudi Arabia (MAROOF 2018).

The process of "MAROOF" is limited to registration by sellers and buyers with limited features and privileges. For instance, as a seller, you create an account to authenticate your related accounts in Social networks. As a buyer, you create an
account that you can browse the seller’s platforms that are signed in the MAROOF platform [FAQ in MAROOF 2018].

The main goal as mentioned in the FAQ official page of the platform is to increase the successful opportunities of the e-commerce/social commerce platforms. Besides, it facilitates the communications and interactions between sellers and buyers which reduce the previous problem of Saudi e-commerce growth mentioned in (Alghamdi et al., 2011). Moreover, ‘MAROOF’ platform increases the trust among consumers. (Hajli et al., 2014) identified the quality of your services which lead us to the next section of "co-creation value" (Pappas et al., 2017).

The main goal in this research is to enhance the methods used in "MAROOF" through a proposed a framework that includes a new rating of word of mouth.

7.0 THE JUSTIFICATION PLAN

Plans are designed to identify the implementation of the research. Besides, two key plans of implementation are identified. First, a laboratory experiment and a survey will be conducted for justification of the proposed framework. Secondly, data collections of the proposed framework will be evaluated to ensure its applicability.

The plan consists of two key parts. First, there will be a laboratory experiment. It will consist of 21 participants testing the framework with a new version of EWOM platform "MAROOF" enhanced by the framework. The experiment includes IT professionals, e-commerce experts, and academic and technical students.

<table>
<thead>
<tr>
<th>Implementation plan</th>
<th>Laboratory experiment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implementation title</td>
<td>Enhance MAROOF through the proposed framework</td>
</tr>
<tr>
<td>EWOM platform sample</td>
<td>Alternative MAROOF prototype</td>
</tr>
<tr>
<td>Characteristics change</td>
<td>Proposed Framework</td>
</tr>
<tr>
<td>Material determine</td>
<td>Computers- internet – specific program for observation</td>
</tr>
<tr>
<td>Number of Participants</td>
<td>21</td>
</tr>
<tr>
<td>Type of Participants</td>
<td>6 IT Agents, 3 e commerce experts, 5 social media users and 6 academic students</td>
</tr>
<tr>
<td>Experiment performance</td>
<td>Prototype</td>
</tr>
<tr>
<td>Type of experiments</td>
<td>monitor performance</td>
</tr>
<tr>
<td>Date of establishment</td>
<td>15 august 2018</td>
</tr>
</tbody>
</table>

Table 3. Plan of the laboratory experiment of the proposed prototype
The second part is a questionnaire categorized into six categories of questions. Each group describes a specific construct of the proposed framework. The questionnaire will test through a statistical program "SurveyMonkey" to avoid bias and ensure a consistent conclusion.

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Building a survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 2</td>
<td>Forms audition</td>
</tr>
<tr>
<td>Level 3</td>
<td>Submit and survey allocations</td>
</tr>
<tr>
<td>Level 4</td>
<td>Convert into statistical program</td>
</tr>
<tr>
<td>Level 5</td>
<td>Result adoptions</td>
</tr>
</tbody>
</table>

Table 4. Plan of research survey to support the justifications

8.0 RESULTS

To implement the prototype, we designed two environments that make the prototype pass through. The first environment considers the trial version. The trial version environment is a free domain with primitive space and storage size. The domain ‘http://www.wix.com/cisahmedprototype’ has taken from Wix.com as a subdomain. The idea of this domain is to implement the design we create on it. The domain was temporary for design use.

Subsequently, we will have another domain to implement the prototype in the second environment "the real environment". The real environment is the domain that we will implement the prototype for the laboratory experiment use. We choose the domain from the famous website company called “Godaddy.com”. The content management system "WIX", our design and the new domain are created by the IPs syncs in the folders of the new domain. The real environment domain is http://www.prototypecis-ksu.com

The second plan "Survey" of justifying the proposed framework is created through "SurveyMonkey.com". We created the questions of the survey depending on each object of the framework. Each question of the survey refers to the part of the framework. The reliability of the survey is centred on either option number 1 or 2. Other options will distort the reliability of the survey. Generally, the survey methods are primitive because it is considered a secondary justification for the theory.
However, the survey presents significant results and supports the credibility of the proposed framework.

First, we created a survey template from the website SurveyMonkey in the Arabic language. Thereafter, the questions were created through the template with the options and the answers for each question. Thereafter, we shared the survey template through email messages, WhatsApp's broadcasts and social media channels.

The Response of the survey was 89 responses. Separated between "78 males" and "11 females". The qualifications are of “11 high school", "5 diploma", "51 bachelor" and "22 advanced studies". The levels of e-commerce experience are "35 amateurs", "47 practitioners " and "7 experts". In the testing and evaluations, we will mention in detail all the answers to the questions mentioned in Table 5.

In the testing and evaluations section, we will present the results of both "laboratory experiment " and "Survey study". The main implementation of the theoretical justification is the laboratory experiment.

The prototype was proposed through the levels of system architecture, system design, and implementations. The laboratory experiment will test the prototype though 21 participants from IT educational industry called "Riyadh College of technology". The steps of the laboratory experiment were mentioned in the section solution. The Excel sheet also mentions the performance of the experiment. The results will be mentioned here in this section. Moreover, some of the feedbacks of the participants have been recorded as follows:

"Great experience, thank you. The website allows me to browse the products and compare between them.". participant No 2

"Right now, I know about the events of some e-commerce platforms. It is amazing and better than the old one.". participant No16

"The idea of exposing the e-store products, events and the assessments. It is really delegated and clear to the audiences". participant No 22

The results of the laboratory experiment consist of the desired benefits which include the co-creation of value benefits, usability benefits and payment methods benefits.
Negative benefits refer to the non-reactions acted by the participant for using the prototype, which mean the rest of the desired benefits left. Co-creations value benefits refer to the products browsing in the prototype and the impressions of the participants. Usability benefits refer to the events browsing and assessments benefits refer to e-store assessments browsing. The elements accounted through excel sheet template already prepares for laboratory experiments for medical and chemistry experiments as a benchmark to appropriate information systems researches and experiments.

Through the development of computing and technologies in the individual's life, mobility devices are important in the social commerce evaluations. The e-commerce platform that not supported to the mobile environment or does not include mobile version for their software or system, they could not evaluated as e-commerce at this level. Therefore, the mobile in social commerce is important and we refer in this paper to evaluate using mobility in the social commerce platforms.

<table>
<thead>
<tr>
<th>Participants</th>
<th>Negative response</th>
<th>Payment methods response</th>
<th>Usability response</th>
<th>Co-creations value response</th>
<th>the desired benefits</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>60.00</td>
<td>8.00</td>
<td>10.00</td>
<td>38.00</td>
<td>59.00</td>
<td>P2</td>
</tr>
<tr>
<td>P2</td>
<td>32.00</td>
<td>8.00</td>
<td>10.00</td>
<td>56.00</td>
<td>68.00</td>
<td>P3</td>
</tr>
<tr>
<td>P3</td>
<td>30.00</td>
<td>19.00</td>
<td>20.00</td>
<td>46.00</td>
<td>70.00</td>
<td>P4</td>
</tr>
<tr>
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<td>10.00</td>
<td>20.00</td>
<td>20.00</td>
<td>56.00</td>
<td>30.00</td>
<td>P5</td>
</tr>
<tr>
<td>P5</td>
<td>30.00</td>
<td>20.00</td>
<td>10.00</td>
<td>46.00</td>
<td>70.00</td>
<td>P6</td>
</tr>
<tr>
<td>P6</td>
<td>45.00</td>
<td>19.00</td>
<td>10.00</td>
<td>35.00</td>
<td>55.00</td>
<td>P7</td>
</tr>
<tr>
<td>P7</td>
<td>10.00</td>
<td>10.00</td>
<td>20.00</td>
<td>60.00</td>
<td>90.00</td>
<td>P8</td>
</tr>
<tr>
<td>P8</td>
<td>7.00</td>
<td>19.00</td>
<td>10.00</td>
<td>77.00</td>
<td>97.00</td>
<td>P9</td>
</tr>
<tr>
<td>P9</td>
<td>10.00</td>
<td>16.00</td>
<td>60.00</td>
<td>90.00</td>
<td>90.00</td>
<td>P10</td>
</tr>
<tr>
<td>P10</td>
<td>35.00</td>
<td>6.00</td>
<td>15.00</td>
<td>45.00</td>
<td>65.00</td>
<td>P11</td>
</tr>
<tr>
<td>P11</td>
<td>10.00</td>
<td>19.00</td>
<td>10.00</td>
<td>76.00</td>
<td>95.00</td>
<td>P12</td>
</tr>
<tr>
<td>P12</td>
<td>10.00</td>
<td>10.00</td>
<td>15.00</td>
<td>65.00</td>
<td>90.00</td>
<td>P13</td>
</tr>
<tr>
<td>P13</td>
<td>30.00</td>
<td>20.00</td>
<td>60.00</td>
<td>56.00</td>
<td>65.00</td>
<td>P14</td>
</tr>
<tr>
<td>P14</td>
<td>40.00</td>
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<td>66.00</td>
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<td>10.00</td>
<td>66.00</td>
<td>80.00</td>
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<td>66.00</td>
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<td>P17</td>
</tr>
<tr>
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<td>15.00</td>
<td>5.00</td>
<td>10.00</td>
<td>76.00</td>
<td>85.00</td>
<td>P18</td>
</tr>
<tr>
<td>P18</td>
<td>30.00</td>
<td>10.00</td>
<td>10.00</td>
<td>66.00</td>
<td>100.00</td>
<td>P19</td>
</tr>
<tr>
<td>P19</td>
<td>85.00</td>
<td>20.00</td>
<td>25.00</td>
<td>45.00</td>
<td>90.00</td>
<td>P20</td>
</tr>
<tr>
<td>P20</td>
<td>10.00</td>
<td>10.00</td>
<td>10.00</td>
<td>66.00</td>
<td>85.00</td>
<td>P21</td>
</tr>
<tr>
<td>P21</td>
<td>10.00</td>
<td>10.00</td>
<td>10.00</td>
<td>66.00</td>
<td>85.00</td>
<td>P22</td>
</tr>
</tbody>
</table>

Table 5. Results of time amounts took by the participants for each part of the prototype
CONCLUSIONS AND FUTURE WORK

The research is worth explorations in the field of e-business and e-commerce. The main goal is to find consistent methodology used in EWOM platforms and to enhance the results of evaluations in Social/Electronic commerce platforms. The benefits are the reinforcement of the trust in social commerce growth, increasing the ability to change the primitive methods used in EWOM platform. "MAROOF" is an example of the EWOM platforms (Al-Ghamdi, 2016) used as an experiment for the proposed framework.

The laboratory experiment and survey study is implemented to get the results that support the justifications. The proposed framework was extracted from the case study of “Starbucks” experiment of converting from traditional commerce into electronic commerce and has been reviewed to support the validations. Therefore, the framework has been designed depending on the theory of social cognitive theory created by (Bandura, 1986). The research provides an algorithm to guide for each part of the framework. Generally, the proposed framework for EWOM improvement is considered as guidance for designing platforms that compare the products and events for e-commerce platforms.
The future work in the framework is a key focus on the proposed framework. The cloud computing technology will provide electronic commerce community for e-stores and EWOM platforms. The idea of cloud e-commerce platforms guarantees the EWOM platforms and e-commerce platform. Moreover, finding a confident environment assures the audience that the products and events are qualified and guaranteed. However, studies and research on the topic are still underway. In addition, the recommendations for the future works are to develop the proposed framework by the new technologies such as data mining and artificial intelligence to apply them in other EWOM platforms as opposed to only the government and private industries.

Appendix A

<table>
<thead>
<tr>
<th>No</th>
<th>Proposed questions</th>
<th>Multi-choice answers</th>
<th>Dependent on other questions</th>
<th>Importance of questions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>General Identifications</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Defined your gender</td>
<td>1- Male</td>
<td>NO</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2- Female</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>My major is</td>
<td>1- High school</td>
<td>NO</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2- Diploma</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3- Bachelor</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4- High degrees</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>My experience in Electronic Commerce platforms</td>
<td>1- beginning</td>
<td>NO</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2- shopper</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3- expert</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Subjective Norms Questions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Are you ready to buy or sell through E-commerce platforms in personal conviction</td>
<td>1- ready</td>
<td>NO</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2- not care</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3- I'm hesitating</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4- No ready</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Are you ready to buy from e-commerce platform through friend advise or advertise from famous social media account</td>
<td>1- ready</td>
<td>YES</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2- not care</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3- I'm hesitating</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4- No ready</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Electronic word of mouth (EWOM) platforms Questions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>What you think about the websites of compare</td>
<td>1- Great</td>
<td>NO</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2- Useful</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Products and evaluating e-commerce platforms such as (TripAdvisor, Trivago, hotel combined) | 3- Need to develop  
4- Not useful at all |
|---|---|
| Do You know "MAROOF.sa" presented by Saudi Ministry of commerce | 1- Yes  
2- I heard about it  
3- No |
| **Co-Creations Questions** | |
| E commerce platforms that includes replies and suggestions and compliant systems | 1- Are Necessary  
2- Useful  
3- Not useful  
4- Annoying |
| E commerce platforms includes ideas polarization "ideas systems" | 1- Are Necessary  
2- Useful  
3- Not useful  
4- Annoying |
| **Usability Questions** | |
| E commerce platforms includes more than Arabic language | 1- Are Necessary  
2- Useful  
3- Not useful  
4- Should not exist |
| E commerce platforms compatible with Mobility devices such as (phones – Tablets ) | 1- Are Necessary  
2- Useful  
3- Not useful  
4- Annoying |
| E commerce platforms compatible with Disabilities (Accessibility) | 1- Are Necessary  
2- Useful  
3- Not useful  
4- Annoying |
| Photos and multimedia that presents products in e-commerce platforms should be real or sufficient sample (fake but point to the products ) | 1- Are necessary to be real  
2- It's O.K. to be fake but present a product  
3- Not big deal  
4- Should be not compatible |
<p>| <strong>Payments</strong> | |</p>
<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
<th>Rating</th>
</tr>
</thead>
</table>
| What are the best methods of pay in e-commerce platforms?                | 1- Cash delivery  
2- Deposit (SADAD, VISA..)  
3- Digital Currencies  
4- Others                     | NO 4                            |
| Do you think e-commerce platforms dealing with all payment methods are better than another platform dealing with one or two? | 1- Much better  
2- Better  
3- Not important  
4- Should not                  | NO 4                            |
| Do you agree of existing 'Loyalty systems' system of discounts and rewards for regular customers in e-commerce platform? | 1- Most Agree  
2- Agree  
3- Maybe  
4- Disagree                   | NO 4                            |

References


Absorptive Capacity and its Potential Role in Supporting Organisational knowledge Creation: A Qualitative Approach

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Abstract
Absorptive Capacity (ACAP) is the ability of a firm to integrate, transform, and apply valuable knowledge required for business success. ACAP is proposed to play a significant role in enriching the process of knowledge creation embraced inside contemporary organizational Information Systems (IS) environments. Many misperceptions surround how ACAP can be measured and understood as an organizational construct. The aim of this research is to decrease such misperception by providing qualitative measures for ACAP dimensions extracted using data from (22) semi-structured interviews conducted with senior managers working in two telecommunication companies, and analysed following Grounded Theory Methodology (GTM) coding techniques. Drawing on our analysis, we propose a relational model that includes measures that can be commonly used in the literature, and treated as guides to IS researchers and senior managers in exploring the rich facets of ACAP. The extracted measures are proposed to offer foundations for shaping where and how further potential organizational assets can be leveraged.

Keywords: Absorptive Capacity, Information Systems, Research and Development, Grounded Theory Methodology.

1.0  Introduction
This section sets the scene of the presented research paper by introducing the key features of its contents. The current research motivation is to uncover measures of ACAP from organizational knowledge foundations. A significant amount of empirical research has used the concept of ACAP (Popović, Puklavec, and Oliveira, 2019). However, very few qualitative valid measures that are able to integrate its various dimensions have been established (Wang & Ahmed, 2007). Conversely, the determination of the study is to direct the attention of organizations to the importance of enhancing their ability to assimilate, transform, and apply valuable knowledge
required for their business success prior to investing in a large amount of expenditure such as buying state of the art IS for instance (Flor, Cooper and Oltra, 2018). The research is oriented towards efficiently acquiring and processing data, information, and knowledge in technology-based industries. Accordingly, the aim is to answer the bellow research question:

“What are the measures that determine organizational ACAP dimension, and that can support potential creation of knowledge? “.

The current research attempts to decrease the misperception in understanding organizational ACAP by providing qualitative measures that determine its potential existence within firms. Aligned with this study these measures can be defined as categories within different areas of an organization that can be improved (Robert et al, 2012). The focus of the paper is directed towards how these dimensions work in a systematized sequence to present ACAP as a logical dynamic competency that promotes organizational enhancement (Elbashir et al, 2011). To do so, we suggest measures empirically extracted using data collected from semi-structured interviews and conducted with 22 senior managers working with two companies in the telecommunication sector. Later, analysed following rigours set of systematic grounded theory coding techniques. The contents in section 2. Delivers a review of ACAP and its dimensions adapted from the (Zahra and George, 2002) model. Following, in section 3. We outline the research methods including data collection, data analysis, and results. All comprehensively by discussing the detailed process of the main GTM coding phases incorporating open and axial coding, and how they were generated. Later, The final segments in section 4. Presents the discussion, managerial implications, and direction for future work.

2.0 Research Background and Review

2.1 The Concept of Absorptive Capacity: An Overview

Researching ACAP has been one of the most frequently stated and explored subjects in organization management throughout the last two decades (Flor, Cooper and Oltra,
The concept is defined as: ‘the ability of a company to identify, assimilates, and exploits knowledge coming from external sources (Cohen and Leviathan, 1990). Historically, the concept of ACAP was mentioned since the seventies. Nevertheless, the latest application of its practice has been related to Cohen and Leventhal (1990). Their definition of ACAP mentioned before it became dominate in almost all research associated with knowledge creation. A proposition by Lane et al. (2006) indicated that ACAP is required to be one of the foremost significant elements needed in organizations to develop research due to its correlation with other widespread organizational fields. ACAP developed rapidly within literature in line with the unique standpoint that the concept is able to offer (Lane et al, 2006). To make the concept more familiar Roberts et al. (2012) presented a real-world analogy by building a similarity between the mechanisms of ACAP inside organizations and a sponge; they correlated the ACAP to a sponge given its material, number of holes, and its nature of water resistance when amount of water enter inside it. All are all strong indicators of its ability to absorb water. Now, the water is able to flow within the holes in the material as the sponge absorbs the water, and as we squeeze the sponge we are facilitating the flow of water. Likewise, any organization is able to absorb knowledge from external sources; nevertheless, it will only do so if the capabilities of its employees are responsive and open to any new knowledge source that can be integrated with their current knowledge base. Importantly, such knowledge streams or flows are enabled using suitable fitting processes, structures, and supporting technologies. ACAP as a construct is seen to be located amongst various fields of organizational learning (Popovič, Puklavec, and Oliveira, 2019), more pragmatic research and individual-driven theory have been studied in various areas of interest such as banking, technology licensing, strategic alliance and organizational learning (Cohen and Leviathan, 1990). Furthermore, studies have examined ACAP as an organizational capability of both individuals and organization (e.g., Cohen and Leventhal, 1990; Minbaeva et al. 2003), or countries as proposed by Mowery and Oxley (1995) and Buzzacchi, Colombo, & Mariotti. (1995).

2.2 Dimensions Of Absorptive Capacity

This section provides a detailed illustration of the previously mentioned ACAP dimensions clarified by Zahra and George (2002). Dimensions of ACAP are defined
as a ‘distinct but complementary capabilities that compose a firm's ACAP. By looking into the dimensions it is understood that they basically represent a set of capabilities or potentials that a certain organization may acquire and exploit to serve its knowledge creation process. ACAP Dimensions are exemplified in figure 1.

![ACAP Dimensions Model](image)

**Figure 1.** ACAP dimensions model (adapted from Zahra and George, 2002).

Our standpoint in this research is that these dimensions can be better attained, facilitated and applied as an input to organizational knowledge creation success. The model of Zahra and George (2002) added more to their conceptualization of ACAP by classifying two synchronized groups called; potential absorptive capacity (PACAP) and realized absorptive capacity (RACAP). They suggested that PACAP in a firm offers capabilities for acquiring and assimilating knowledge, where prior knowledge plays a major role inside the organization. RACAP is the ability of a firm to combine the prior owned knowledge with newly attained knowledge by having set of procedures that are able to support this combination and refinement of knowledge, or in other words knowledge transformation. RACAP refers to knowledge exploitation indicating the capacity of the firm to exploit newly gained knowledge, and efficiently apply it in services and product, which can lead to better performance and financial profit.

- **Acquisition**
  The acquisition is the ability to recognize, obtain, and grasp external knowledge required for organizational processes and growth (Popovič, Puklavec, and Oliveira, 2019). Many scholars considered the dimension acquisition as an effective generator
of knowledge that seems to appear through proper investments in R&D (Zahra & George, 2002). These authors suggested three important aspects that describes effort used in knowledge acquisition and which can eventually influence ACAP, the aspects are (intensity, speed, and direction). Intensity coupled with the speed of effort are vital aspects to recognize and collect knowledge in firms, moreover, they are able to define the quality and degree of a firm's acquisition competencies. In other words, and according to (Kim, 1997) the extra the effort that the firm provides in acquiring knowledge, the more quickly the firm will shape necessary capabilities.

• **Assimilation**

The definition of Assimilation by Kim (1997), and Szulanski (1996) was cited in Zahra & George (2002) refers to the firm's routines and processes that allow it to analyse, process, interpret, and understand the information obtained from external sources. Zahra & George (2002) explained that philosophies and findings that lies outside an organization’s search zone are somehow disregarded, since the firm cannot easily understand them externally, moreover external knowledge coming from outside either outside a department or outside the organization may involve heuristics that are totally inconsistent with the current heuristics used by that firm or organization. Consequently, this may cause a delay in understanding knowledge and processing (Leonard-Barton, 1995). External knowledge is required to be specific in terms of context and contents. The difficulty of grasping knowledge lies in the value of knowledge when the value of knowledge is dependable on its complementary asset; the more difficulty appears in grasping and relating it with external knowledge (Teece, 1981). Eventually, the comprehension of knowledge and being able to understand is a key role successfully assimilating the external knowledge (Zahra & George, 2002).

• **Transformation**

Transformation describes the ability of the organization to do series of refinement on its current routines so that it can be combined with newly acquired knowledge. Zahra & George (2002) acknowledged that the process of refinement can be done by the addition or deletion of knowledge, or may also be accomplished by augmenting the same acquired knowledge in different directions. Zahra & George (2002) suggested using what is called Bi-Sociation; in their description of the transformation
dimension. Bi-association is a process that leads to transformation. Bi-association arises when an idea appears in two dependable but incompatible settings of resources. Subsequently, the capability of the organization to absorb information formulated in a shape of two inconsistent forms coming from different resources and then associate these pieces of information to produce knowledge is required to be a successful practice of transformation (McGrath & MacMillan, 2000). The transformation has been linked to a strategic change in many positions within literature. Strategic change or strategic organizational transformation is described when a constructive change appears within the firm's routines and knowledge. According to Zahra & George (2002) strategic change presents new knowledge for reframing organizational description of the industry and competitive strategy.

• Exploitation

Exploitation highlights the application of knowledge. Exploitation as an organizational competency is grounded on practices and routines that permit organizations to refine, outspread, and influence existing capabilities, otherwise to generate new different ones by incorporating acquired and transformed knowledge into its operations (Cohen and Leventhal’s, 1990). Exploitation key role lies in reflecting a firm's capability in producing and integrating knowledge into its processes and operations (Van den Bosch et al., 1999). This integration mechanism desires to retrieve knowledge that has been previously produced and adopted for practice (Lyles & Schwenk, 1992). Consequently, the output of the exploitation capability is the formation of new services, products, systems, and knowledge. A good example of the exploitation capability can be apparent when looking at new projects that tend to collect knowledge from different essential resources such as customers, competitors, and market. And they later use this captured knowledge in creating novel proficiencies. Likewise, prosperous recognized organizations are expected to inaugurate routines that position their knowledge and target it to improve current visions or inspire new creativities inside their environment (Rumelt, 1987).

2.3 The Association Between Absorptive Capacity and Information Systems

A connection between ACAP and (IS) research appeared in a revision by Robert et al (2012), the main drive of the study was to refine the current understanding of ACAP and directing its operative practice in IS studies. They reviewed this construct by
tracing the evolution of ACAP literature in organizations observing issues linked to its conceptualization effects and organizational learning. Moreover, they examined how ACAP has been measured, theorized, and then utilized in the IS research field. Consequently, they proposed a framework aimed at researches that links ACAP to IS and Information technology. Interesting work that focused on this connection includes Elbashir et al (2011) and Robert et al., (2012). They ascertained on the importance of the capability to collect, absorb and strategically control new information coming from external sources for creating a suitable technological set-up, and to integrate information systems for achieving better organizational performance. Additional outcomes of their studies demonstrated issues related to managerial hierarchy, they proposed that top management plays an indirect but critical role in effectively positioning information systems.

3. Research Methods

After creating a broad-spectrum review in exploring ACAP and its dimensions in the above sections, the research intended to investigate the empirical interface in exploring ACAP. Grounded Theory Methodology (GTM) was used as the core research method due to that ACAP was treated as an imprecise type of organizational control that required further investigation. The research question was explored using prior literature review without any settings for research hypotheses. However, the phenomenon of ACAP was still unclear until explored openly using GTM. The current study was significantly influenced by Strauss & Corbin (1998) school of GTM, as the two scholars believe that researchers can use GTM for building a systematic rigorous understanding of a certain phenomenon, and not essentially to extract a theory. The empirical design is shown in figure 2. Demonstrates that the there is an apparent interaction in GTM between data collection and analysis as they both initiate synchronously (Bryant, 2002).
The above design in figure 2. Presents an illustration of the inductive empirical data collection and analysis methods that are qualitative in their nature. The research question offered a broad perspective of the research concern. Consequently, once a specific site for collecting data has been originated the process of the data collection was initiated accordingly (Bryant, 2011). GTM open and axial coding processes were employed in the analysis phase resulting in extracting ACAP categories and assigned to themes as a result of the axial coding process. Memo writing and theoretical saturation mentioned in the design made this approach dissimilar from other approaches. Memo writing is a process where the researcher writes notes throughout the research; memos might include events, categories, or relationships observed and written while initiating the collections and analysis phase (Gibbs, 2018).

3.1 Data Collection

Empirical data collection in GTM is the process of focusing on collecting novel data rather than permitting theoretically collected data to direct the researcher perspective (Charmaz, 2001). According to Gibbs (2018), GTM researchers always demonstrates openness while collecting the data, openness refers to being open-minded in receiving answers from participants and not being biased to any previous knowledge owned (Gibbs, 2018). Semi-structured interviews were chosen as the core data collection
The interviews enclosed open questions given the fact that the research is mainly following GTM. Interview questions probed into how each participant can explain the existence of potential scopes treated as knowledge creation elements in their organization according to the given interview questions, and how they went about exploiting such realization. In each interview, a set of (10) questions was asked for each person participating in the study.

<table>
<thead>
<tr>
<th>Perspective Category</th>
<th>Number of Interviewed Participants</th>
<th>Length of Work Experience</th>
<th>Managerial Level</th>
<th>Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head of data analytics</td>
<td>2</td>
<td>10</td>
<td>Top Manager</td>
<td>Telecom</td>
</tr>
<tr>
<td>Chief information officer</td>
<td>1</td>
<td>9</td>
<td>Top Manager</td>
<td>Telecom</td>
</tr>
<tr>
<td>Marketing head</td>
<td>2</td>
<td>15</td>
<td>Top Manager</td>
<td>Telecom</td>
</tr>
<tr>
<td>Risk manager</td>
<td>2</td>
<td>8</td>
<td>Top Manager</td>
<td>Telecom</td>
</tr>
<tr>
<td>Product development manager</td>
<td>2</td>
<td>9</td>
<td>Top Manager</td>
<td>Telecom</td>
</tr>
<tr>
<td>Senior cost analyst</td>
<td>2</td>
<td>5</td>
<td>Top Manager</td>
<td>Telecom</td>
</tr>
<tr>
<td>Data Platform Engineer</td>
<td>2</td>
<td>10</td>
<td>Middle Manager</td>
<td>Telecom</td>
</tr>
<tr>
<td>Technology leader global analytics</td>
<td>2</td>
<td>12</td>
<td>Top Manager</td>
<td>Telecom</td>
</tr>
<tr>
<td>Business intelligence analysis head</td>
<td>2</td>
<td>4</td>
<td>Middle Manager</td>
<td>Telecom</td>
</tr>
<tr>
<td>BI and data analytics Senior Consultant</td>
<td>3</td>
<td>5</td>
<td>Senior</td>
<td>Telecom</td>
</tr>
<tr>
<td>Director Of human resources reporting And analytics</td>
<td>2</td>
<td>14</td>
<td>Top Manager</td>
<td>Telecom</td>
</tr>
</tbody>
</table>

Table 1. Specification for interviewed participants.

Table 1. Presented detailed specification for interviewed participants from two organizations based in Jordan. Both companies are currently using BI solutions; and both required as strong competitors, with similar employee’s number and size, the target was to find two similar companies with least differences. The study will not concentrate on the telecom industry business value chain, the goal was to find companies in the IS environment that deal with data challenges and already have BI solution assimilated within. The positions were altered to match the companies’ different position categorization. Consequently, to accumulate the greatest number of seniors engaged as participant in the study. Participants in table 1 are specified according to their industry, managerial level, and length of work experience. A total of (22) practitioners were chosen from the telecommunication industry, different senior levels (Heads, leaders, senior consultants, and top level and middle managers),
different languages mainly Arabic and English, and different level of experience ranging from (4) to (14) years as described in table 1.

3.2 Data Analysis

Data analysis in the current study relied primarily on two data coding techniques guided by GTM: open, axial, coding. A code in GTM is a specific indication of the main issue or phenomenon that is going on in the text or collected data (Gibbs, 2018). Additionally, coding references a process of reducing the data without changing the meaning of the data starting with a large amount of data and ending with a grounded abstract view of the data. NVivo software was used to code the data by first uploading all interviews as one whole transcript and conducting a line by line coding to all answers of the participant's transcripts. In this phase, coding was required as a systematic automated technique for segmenting data into smaller units called sub-nodes, and categories in GTM. The configurations of categories enabled the researcher to gain a deeper rationale of the knowledge creation potentials that were extracted from the interview answers. Mixed Methods were encapsulated within GTM such as theoretical saturation, memo writing, and finally mapping results with previous literature review for validation issues.

<table>
<thead>
<tr>
<th>Interview Question</th>
<th>Answer</th>
<th>Memo</th>
<th>Memo Date /Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you have specific practices inside your organization that reflects any degree of data sharing between departments or outside the organization scope? Please provide examples?</td>
<td>In our company there is a quick information flow, e.g., if a business unit obtains important information it communicates this information promptly to all other business units or departments. And our management demands periodical cross-departmental meetings to interchange new developments, problems, and achievements.</td>
<td>Relate this when coding to &quot;<strong>Assimilation Node in Nvivo.</strong> SUGGESTED CODES in interview: Information Flow, Other business units or departments, Interchange new developments. Saturation reached after this answer.</td>
<td>March 20/2018, Tuesday, 11:00 Am. Zain Head office</td>
</tr>
</tbody>
</table>

Figure 3. Memo/open coding analysis for the current study.

Figure 3. Presented a sample of a memo extracted from the analysis process of the current research. Generating effective memos helped in assisting the process of coding the data, extracting categories, and extracting relation. Moreover, the use of
memos was undertaken to document any similarities and differences that had appeared while collecting data, and coding the data.

Figure 4. Number of participants reaching theatrical saturation.

A minimum number of (3) participants were used to reach the theoretical saturation, with no maximum limit as presented fig 4. Theoretical saturation in the current research demonstrated the process of knowing when exactly to stop with collected data, and also when to stop with coding the data needed for extracting new categories, seeking for variation or similarities. In GTM there is no standardized way to reach saturation participant number calculation, it is according to the transcripts contents (Gibbs, 2018). The main intention of this technique was to promote a final refinement of certain categories and properties, also allowing maintaining the balance between learning from empirical data and existing theories without diminishing the value of an inductive approach (Charmaz, 2012).

3.3 Results

Open Coding Results

We obtained a total of (19) extracted categories using open coding technique obtained from the 22 interviews transcripts as illustrated in figure 5.
Each category was coded as a sub-node in NVivo, later was rationalized into the suitable main node that is referenced as a theme in the axial coding process. In open coding, the main input was the participant's transcripts, and the final output was the developed categories. Open codes were extracted by assigning a phrase to represent a certain chunk of data performed open coding and then labelling this data according to respondents answering patterns, the essence was to reduce the amount of data (Glaser, 1978). Table 2 below illustrates the total of (19) categories extracted through the open coding process. Appendix A provides a wider sample of the categories, their brief explanations, and an example from the participant answers provided for each extracted category.

**Axial Coding Results**

The result from axial coding is (19) categories classified into (4) pre-defined themes: Acquisition, Assimilation, Transformation, and Acquisition. Classification process was based first on evaluating the categories logically into four main classes according to (Strauss and Corbin, 2001) ACAP model. The input to the axial coding was the extracted categories; the output is building a relational model that relates each theme of ACAP into its corresponding category as illustrated in figure 6.
Thematically and as recommended in GTM research, the current research applied Strauss and Corbin (2001) paradigm model components that guided the axial coding model creation to generate themes in axial coding. Each component of the model allowed the reflection of certain theme of axial coding. Paradigm model theoretical component are as follows;

- **Casual conditions**: selecting any categories that may have a cause that influenced the central phenomenon of the research - knowledge acquisition, knowledge assimilation were chosen as causal condition of the central phenomenon of the research.

- **Phenomenon**: a Central phenomenon in the study by itself – (Absorptive Capacity effect on knowledge creation.)

- **Actions /Strategies**: researcher asked questions about people in the organizations

- **Consequences**: Outcomes of results of actions, and results from the strategies.

Fig 7. Illustrates how each dimension of ACAP relates to a specific component within the GTM paradigm model. In axial coding, it was looked at the conceptual categories extracted from the open coding phase. Their interdependencies were examined for outlines that might explain the relation between ACAP different dimensions. In line with the current research the process of linking categories to fit each of the ACAP dimensions is referred to axial coding (Strauss and Corbin, 2001). The results
presented a total of (7) categories were found relevant to the dimension Acquisition, (5) categories for Assimilation, (3) categories for Transformation, and (4) categories for Exploitation. Explained in bellow table 2. Number of categories related to each theme as a process of axial coding.

<table>
<thead>
<tr>
<th>Number Of Classified Categories to each Theme</th>
<th>Theme Name/ACAP Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Acquisition</td>
</tr>
<tr>
<td>5</td>
<td>Assimilation</td>
</tr>
<tr>
<td>3</td>
<td>Transformation</td>
</tr>
<tr>
<td>4</td>
<td>Exploitation</td>
</tr>
</tbody>
</table>

Table 2. Number of categories /themes of the current study.

It is imperative to mention here that axial coding was not grounded in extracting the selective themes, however, the purpose was to relate our grounded categories from open codes to the main dimensions of ACAP that references the model of (George & Zahra, 2012). A relational model was built subsequently to illustrate these relationships between each theme and its corresponding categories, as in figure (8).

![Final relational model for ACAP dimensions measures.](image)

Figure 8. Final relational model for ACAP dimensions measures.

Drawing on the extracted model, proposed categories where coded according to the answering patterns established within the number of participants through an open
coding process. Later, these categories were assigned to the dimensions of ACAP referenced as themes within the GTM reflection.

4.0 Discussion

4.1 Theoretical Implications

The current study addressed an analysis of the literature on the general understanding of ACAP and its dimensions. Later, exploring ACAP dimensions by developing (19) qualitative items, and classifying them into (4) dimensions that are able to measure the dimensions of ACAP suggested in Zahra & George model (2002). The extracted measures are anticipated to function as a foundation from which to compare findings across ACAP studies such as a significant consideration of (Flatten et al., 2011) which offered a scale development approach of measuring ACAP. However, this study proposed an alternative qualitative scale for measuring the concept of ACAP, making it possible to apprehend the value added of ACAP as an organizational construct in technology based industries.

4.2 Managerial Implications

The study offers senior managers in technological industries with a reasonable set of assessed measures that are proposed to evaluate their organizational weakness and strengths concerning ACAP perspective. The extracted measures are proposed to offer foundations for shaping where and how further potential organizational assets can be leveraged. While viewing the extracted measures managers can consider what they already have from these sets, and what is missing or needs to be further discovered.

The current study main contribution lies in proposing measures that found to be linked to one or more of areas summarized by :(1) organizational human recourse abilities, (2) organizational financial abilities, (3) organizational relational and interpersonal abilities, (4) organizational technical and technological capabilities, and (5) decision making outcomes and innovation outcomes. All extracted measures are linked to one or more of the given areas. By settling these concentrations, the presented managerial implication reinforced the fact that the four dimensions of ACAP were strongly
supported empirically within our study resulting from consistent managerial implications for each ACAP dimension as the following:

- **Acquisition**: the developed measures that signified the acquisition dimension are harmonized with the definition proposed by Lane & Lubatkin (1998) as the ability to recognize, obtain, and grasp external knowledge required for organizational processes and growth. Measures such as management support for data exchange, research development activates and investments, periodical meetings and workshops found to be supported in terms of acquisition capabilities within the organization. To be more specific in describing acquisition measures and basis for extracting them; a good number of managers stressed the idea of having in their department’s external resources the can assist in obtaining information (e.g., personal networks, consultants, seminars, internet, database, professional journals, academic publications, market research) However, others stressed that they require these components and it is misplaced in their company. Consequently, we considered this as an essential measure to be coded as a category in the open coding phase. While other managers stressed that as managers they do assign financial budgets, or at least they are aware of organizational pre-setting for budgets that support any data obtainability initiatives, such as paying for external data providers, which revealed the category (well-established relations with data providers). Also, allocating budgets for workshops, and seminars that can provide better data accessibility and knowledge controls for employees within their departments (Abdelrahman et al., 2016).

- **Assimilation** was measured in regards to categorization that emphasized the importance of achieving timely data flows within departments, employee’s literacy for acquired data, and departmental employees communication, and technological readiness. All these categories found to be in line with the cited understanding of assimilation proposed by Zahra & George (2002), which refers to the firm’s routines, and processes that allow it to interpret and understand the information obtained from external sources. The extracted categories were treated as routines for encouraging understanding the acquired information.

- **Transformation**: resulted in measures that stressed the importance of contemporary information technologies that can play a very important role in the development and growth of a firm’s ACAP (Popovič, Puklavec, and Oliveira,
2019). By recognizing the importance of information technologies and treating information technologies as a strategic source that can provide ACAP transformation (Wade and Hulland, 2004), managers are encouraged to identify and invest in technical requirements such as robust and effective data security measures, open architectures, infrastructural technologies and data repositories. Consequently, building and investing modern digital technologies facilitates what so-called ‘learning-by-doing' which by itself is considered a transformations attribute that helps in recognizing new data and responding to any type of novel information technologies that support ACAP (Sambamurthy et al. 2003).

• **Exploitation**: the resulted measures reflected the dimension exploitation as an integral output and realized dimensions of ACAP, conflicting with the proposal of Torodova and Durisin (2007) that suggested that both transformational and exfoliation are not required to be substantial aspects of ACAP comparing to assimilation and acquisition dimensions. Acknowledging exploitation when measuring ACAP facilitated in highlighting the potential outcomes resulting from implementing the potential ACAP dimensions mentioned above (Flatten et al., 2011). Exploitation dimensions in line of the current research measures proposed significant constructions such as that quality decision-making initiatives, innovative products and services, and the ability to adopt new technologies are required to be realized sets of outputs attained from employing the previous potential ACAP dimensions.

**5.0 Limitations and Recommendations for Further Research**

A limitation of this study is the focus of the research on only one country and one sector. Organization in the telecommunication industry in Jordan deal with high volumes of data daily, these sectors are found to face challenges in acquiring and processing data and knowledge from a mass number of daily users to maintain their ACAP current. Thus, we cannot generalize that our extracted measures apply in other industries, or other countries given the fact that certain industries are characterized with certain organizational and domestic cultures that direct their organizational process, and managerial development (Hofstede, 2001). Consequently, future research will be directed towards a different scale of improvements for the ACAP constructs.
Future research will also incorporate evaluating the extracted measures in terms of how they can affect specific Business Intelligence Systems and decision-making systems in different managerial levels, seeking an overall organizational efficiency and competitive advantage.

References


### Appendix A

#### Examples Of Extracted Codes, and Categories

<table>
<thead>
<tr>
<th>Axial Coding / Theme / ACAP Dimension</th>
<th>Open coding / Category (C)</th>
<th>Abstract Definition/ Description</th>
<th>Sample from Participants answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquisition (C1) Management support For data exchange</td>
<td>This category was built upon codes from participants that described any managerial initiatives for encouraging data exchange or within the interviewed teams, departments, and individuals. (Flatten et al., 2011).</td>
<td>“Yes, as a telecom company, we have formal managerial policies, procedures for allowing data exchange amongst different departments.” “I feel that it is appreciated when employees in my department procure information from other industries as well” example: we do collaborate with the finance department and marketing for asking for certain data sets needed.</td>
<td></td>
</tr>
<tr>
<td>Acquisition (C3) Well-established relations with data providers</td>
<td>Referencing all codes that ascertained the obtainability of ‘data sets’ from different providers, suppliers, or even competitors. Can be either commercial providers or others that can add value to the department’s research and knowledge creation Zahra and George (2002).</td>
<td>“I am aware that our strategic management established strategies for good relations with data commercial providers such as data providers “x” and international company ‘y’, potential data providers, suppliers for our hardware equipment also sometimes provide us with specific data analytics if required”.</td>
<td></td>
</tr>
<tr>
<td>Acquisition (C4) Research development activates and investments</td>
<td>This category is directly designated an indication for the researcher to relate to the acquisition dimension in absorptive capacity, as most participants who indicated research and development presence for a department who supports this category, research and development initiatives were coded</td>
<td>“Our department has allocated specialized personnel to deal with research and potential research but no formal department”. However, we do have a special R&amp;D department with 6 formal staff”. “Our organizations have publications registered under its name”</td>
<td></td>
</tr>
<tr>
<td>Category</td>
<td>Code</td>
<td>Description</td>
<td>Example</td>
</tr>
<tr>
<td>----------</td>
<td>------</td>
<td>-------------</td>
<td>---------</td>
</tr>
<tr>
<td>Acquisition</td>
<td>C5</td>
<td>Periodical meetings and workshops</td>
<td>This category referenced all codes from participants that indicated that their organization supports any kind of timely meetings either with external experts that can add more acquired knowledge to employees, or could be only periodical meetings between staff and management on regular basis. (Flatten et al., 2011) “Actually, we do develop annual or semi-annual workshop inviting experts to discuss potential technological issues, we even encourage latest trends in the field of telecommunications by allowing engagement with workshops that allows employees and managers to meet international speakers that can be both academic or professional from the industry”.</td>
</tr>
<tr>
<td>Acquisition</td>
<td>C6</td>
<td>Allocating financial budgets</td>
<td>This category referenced any financial support form management to support any data acquisition activities (Elbashir, Collier and Sutton, 2011). “As far as I am concerned, We have special annual budgets for specialized telecommunication specific Projects. Supporting financially any potential courses for employees that can lead to skills enchantment and enhancing the learning process”.</td>
</tr>
<tr>
<td>Acquisition</td>
<td>C7</td>
<td>Human resource competencies</td>
<td>This category is defined as a combination of any determinate, considerable knowledge, skills or personal elements that were required as enhancers to the employee performance in acquiring knowledge and contribution for organizational success in assimilating potential systems. (Robert et al, 2012) “A consideration as a department Support financially any potential courses for employees that can lead to skills enhancement and enhancing the learning process.</td>
</tr>
<tr>
<td>Assimilation</td>
<td>C10</td>
<td>Departmental employees communication.</td>
<td>This category is different from the previous category that indicated cross-departmental data “Informal/formal communication amongst employees is encouraged in our organization to support data exchange.</td>
</tr>
</tbody>
</table>
exchange. The departmental employee's communication was found to be mentioned by most participants engaged in the subsequent data acquirement phase in both companies. (Elbashir, Collier and Sutton, 2011).

| Exploitation (C16) Innovative products and services | This category was extracted with its high relevance to the telecom industry, referencing the number of new products, services they produce with the aid of all provided data acquisition, assimilation, and exploitation categories mentioned above (Flatten et al., 2011). | “However, we launched last year innovative products/services promptly with regard to our outcome of research, process, and analysis. Such as latest mobile devices in the telecom and bids for offered lines." "Our company has a number of patents in regards to its announced products “ |
ABSTRACT

Earlier research has focused on the single dimension of disruptive innovation that originates in the low-end market. Disruptive innovators tend to focus on targeting niche markets at the lower-end of the economic ladder, providing alternatives to existing products. Disruptive innovators that originate in low-end markets are inferior to existing products. However, they improve over time to attract mainstream customers and take over incumbents. This single dimension has ignored the disruptive innovation that originates in the high-end market in terms of superior products. This research focuses on the latter context and the notion of consolidating high-end disruption into disruptive innovation frameworks. High-end disruptive innovation is successful when escalated affordably. Customers cannot afford superior products in the high-end market, though with passage of time they achieve affordability and attract mainstream customer to disrupt the market. In both cases, market incumbents ignore disruptive innovation. They enjoy profit margins at the expense of low-end disruptors and overlook market volume at the cost of high-end disruption. Initially, in both cases, incumbents react by driving profitability through sustaining innovations.

Keywords: Disruptive Innovation, Low-End and High-End Market, Low-Cost, Affordability, and Incumbents

INTRODUCTION

Over the past 20 years, disruptive innovation has emerged as a symbol for rapid growth and technological advancement and it has received interest from academics and experts alike (Isaacson, 2015; Berkun 2010; Christensen et. al, 2015). The increasing use of disruptive innovation theory is not constrained to the discipline of innovation but has been widely applied to technology (Hardman et,
al 2013), education (Thompson, 2016) and other industries such as healthcare (Ramdorai and Herstatt, 2015). Regardless of the exclusivity of these different fields, the underlying notion of disruptive innovation is considered to be permanent as a result of different business settings. That is why it can be examined as a progressively independently concept. Nevertheless, for the same reason, disruptive innovation has been widely researched across divergent industry settings such as in computing (Akar and Mardiyan, 2016), hospitality and tourism (Guttentag, 2013; Joshi, 2018), healthcare (Ramdorai and Herstatt, 2015) and the automotive industry (Bohnsack, Pinkse and Kolk, 2014).

The evolution of new technologies has had a significant effect on existing technologies and has transformed many industries. These new technologies not only challenge traditional technologies but also render them obsolete in some industries. The introduction of disruptive innovation theory has practical implications for these transformations. Most of them are based on low performance attributes that are initiated at the lower end of the market. Contemporary studies have raised questions regarding technologies and businesses that have transformed traditional technologies at the high end of the market (Akbar and Ozuem, 2018; Rhee et. al, 2012). The philosophical impact of technologies or businesses in the high-end of the market can be explored from the perspective of disruptive innovation theory. Conventionally, disruptive innovation theory shapes existing technologies or businesses by targeting the existing market or by creating new markets. In both cases disruptive innovation originates at the lower-end of the market (Christensen Macdonald and Raynor, 2015).

In this context, it can be argued that conventionally disruptive innovation has focused on a single market dimension i.e. the low-end market (Christensen et al., 2015, 2018). Yet it has not been investigated in the context of the high-end market. Existing theory in relation to disruptive innovation fails to explain high-end disruptive innovation. As a result, current thinking gives managers the single option of using low-end market strategies to create disruptive innovation. Consequently this paper tries to fill a gap in knowledge by highlighting the importance of high-end disruptive innovation strategies that can be used by managers to achieve competitive advantage. Nonetheless, the high-end market has received little attention. In business and innovation management, encroachments from the higher-end market and affordability strategies are the least understood and most emergent areas.

**Contextualization: Disruptive Innovation.**

Many scholars defined innovation in relation to the dimension of product, process and service contemplating the degree of novelty (Luecke and Katz, 2003; Albury, 2005; Jacobs and Snijders 2008). While extant literature provides divergent meanings of innovation, Assink defined it as “*The process of successfully creating something new that has significant value to the relevant unit of adoption.*” (Assink, 2006, p.217). Conversely, for both academics and practitioners, disruptive innovation means different things. For instance Assink (2006) defined disruptive innovation as “…to generate and explore radical new ideas and concepts, to experiment with solutions for potential opportunity patterns detected in the
market’s white space and to develop them into marketable and effective innovations...” (P.219). In the existing literature, one perception is that disruptive innovation originates in existing or new markets at the lower end (Christensen et al., 2015). Equally, ignoring the impact of innovation at the high-end can result in challenges for the firm (Hardman et al., 2015). Nevertheless, some researchers have attempted to explore technological transformation as a form of radical innovation. Some suggest that radical innovation creates more difficulties for incumbents as compared to incremental innovation (see Ettlie, Bridges and O'Keefe, 1984; Dewar and Dutton, 1986). However, the complexity of forming these categorizations into a coherent framework increased when some academics presented a completely different categorization. Such academics argued that, in terms of discontinuing innovation, the causes and challenges faced by existing firms is difficult to understand. Some firms have successfully managed radical innovation. As a result, they have conceptualised innovation as a form of either enhanced or destructive competence transformation (Tushman and Anderson 1986). In contrast, some academics have determined that present categorizations do not account for failure amongst incumbents. In such cases they have defined innovation as either modular or architectural (Henderson and Clark, 1990).

Though, Christensen's (1997) typology for sustaining disruptive innovation has increased the complexity of incorporating high-end disruption. This has led to a different understanding of disruptive innovation theory in the contexts of different dimensions of the marketplace. The crucial aspect of this study is to understand the process and reality of disruptive innovation. Disruptive innovation begins with the emergence of different sets of performance attributes in existing or new markets at the lower end of the economic ladder. Mainstream customers view these products as unattractive because of their low performance features. Whereas, over time these performances improve and attract mainstream customers from mainstream markets to achieve disruption as in Figure 1.1 (Yu and Hang 2010; Vance, 2013). However, the scope of conceptualisation that disruption only adapts to low-end encroachment remains complex. Likewise, superior and distinct performance attributes adapt to high-end encroachment by achieving affordability to attract mainstream customers. The nature of the high-end market inherently makes it suitable for unique performance attributes. Organisations can thus achieve efficiency in production. Such conditions increase the potential for entrants to attract mainstream customers in order to disrupt the market (Rhee et al., 2012; Govindarajan and Kopalle, 2005; Schmidt and Druehl, 2008).
The High-End Market and Affordability

The concept of the high-end market is the subject of various definitions in the literature. For example, Rhee et al. (2012) suggest that some firms enter the high-end market and then diffuse downwards using distinct strategies. This kind of market encroachment has been described using three different labels. The first is ‘immediate high-end encroachment’ which describes the pursuit of customers in ‘old markets’ in high-end settings. This involves stealing some of the original market share. The second format is ‘new attribute high-end encroachment’ comprising of improvements to original products and the addition of new dimensions to attract both existing and new customers in the high-end market. Finally, ‘New Market high-end encroachment’ describes the attraction of customers to new markets at the high-end (Rhee et al., 2012, p. 721).

The literature highlights the phenomenon of disruptive innovation in existing and new markets at the lower-end. Initial performance is typically inferior to existing performance in the mainstream market. Low-end customers are attracted to such performances because of their low cost and distinct features, which are more appealing than many existing features. Though, over time, these performances are improved to attract mainstream customers as a result of disrupting the market (Govindarajan and Kopalle, 2005). In contrast, innovation that carries a high price is considered to be a form of high-end disruptive innovation (Govindarajan and Kopalle, 2005). This is a grey area that is overlooked by Christensen’s theory of disruptive innovation. For example, corporate executive welcomed, the introduction of the cellular phones despite the fact that they were seen as expensive. Yet, mobile phones enjoyed success since they offered convenience and portability. Despite the advantages that mobile phones offered over landline phones, mainstream customers continued to favour landlines for their comparatively low prices, better coverage and reliability. Yet, over time, mobile technology caused disruption, as the progression of technology made it possible to increase the coverage and reliability of the service at a cost that was acceptable and affordable to mainstream customers. Likewise, the high-end market is an appropriate setting to target customers that are looking for superior performance.
attributes that are not available in mainstream markets. Price, in the context of superior performance is high and is typically out of reach for mainstream customers. Conversely, over time these firms achieve efficiency in production along with developments in other technologies that brings costs down and makes the product available to mainstream customers at a price they can afford see figure 1.2 (Rhee et al., 2012). Nevertheless, the primary step to disrupting the market at the higher-end is costly and challenging because it requires huge investments from the outset. For example, Chobani required approximately $1 billion of investment to disrupt from the higher-end (Vazquez Sampere, 2016).

On the other hand, the nature of low-end market disruptive innovation seeks out the least profitable customers, as they are not looking for superior performance features. As a result, market incumbents ignore these entrants and instead focus on improving their existing products to make more profit from mainstream customers (Christensen, 2006; Yu and Hang, 2010). Consider the example of Honda, which entered the US market with its flagship scooter, thus focusing on the least profitable customers. Incumbents did not view this manoeuvre as a threat. Likewise, new market disruption that focuses on prospective consumers gives rise to a new industry. For example, stents initially involved itself in the catheter diagnosis market, but later diffused down into the cardiac surgery markets (Vazquez Sampere, 2016). Conversely it can be argued that incumbents also ignore disruptive innovation in higher-end markets because they want to increase their market share by driving sales volumes whilst ignoring disruptive innovation as a threat.

Looking at these two contrasting phenomena it can be argued that disruptive innovation can be achieved not only at the lower end of the market, but in high-end markets as well. The commonality between the two formats is affordability. Christensen’s (1997) theory of disruptive innovation specifically speaks about improved performance over time in low-end markets, so that the product can be adopted in mainstream markets. Though, this ignores the fact that performance in
high-end markets is already superior. To cause disruption, organisations only need to achieve superior efficiency in production to make the product affordable for the mass-market consumer. Tesla, for example has created a new model of disruption, in which products start at the high end of the market while encroaching down over time by achieving efficiency. During its 10-year history Tesla’s initial prices were eccentrically high, at approximately $100,000. This was reduced to a price of $70,000 in 2015, and its latest version in 2017 is priced at $35,000. The latest version, a Model 3 Sedan has secured 400,000 pre-orders (see Rhee et al., 2012; Eisler, 2016; Butler and Martin, 2016). However, it must be noted that not all innovation at the high-end of the market is seen as affordable, and so not all innovations can disrupt the market. Such products are considered luxurious and they are popular with ultra profitable customers in ultra premium markets. Examples of these products include Ferrari and Lamborghini, which only serve ultra premium markets. These kinds of products have established their image as luxurious products and therefore only serve the ultra premium niche market.

Consequently, it can be argued that disruptive innovation from the lower-end of the market seeks to improve performance, while in higher end markets it seeks to achieve efficiency to bring costs down. In both cases the commonality is affordability. Despite the market segment context, if disruptive innovation products provide unique and improved performance attributes, and appeal as substitutes to existing options at affordable prices to attract mainstream customers, this can lead to disruptive innovation. The following table shows characteristics of low-end and high-end disruptive innovation.

<table>
<thead>
<tr>
<th>Disruptive Innovation</th>
<th>Low-End Disruption</th>
<th>High-End Disruption</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Originate in low-end market</td>
<td>1. Originate in high-end market with different attributes</td>
<td></td>
</tr>
<tr>
<td>2. Ignored by Incumbents</td>
<td>2. Ignored by Incumbents enjoy profits from existing customers through sustaining innovation.</td>
<td></td>
</tr>
<tr>
<td>3. Incumbents enjoy profits</td>
<td>3. Disruptive Innovation brings cost down and achieve affordability</td>
<td></td>
</tr>
<tr>
<td>from existing customers through sustaining innovation.</td>
<td>4. Incumbents sustaining innovation over shoot the market</td>
<td>5. High-end disruptive innovation becomes affordable and adopted by mainstream customers</td>
</tr>
<tr>
<td>4. Disruptive Innovation</td>
<td>5. Mainstream Customers divert to disruptive innovation</td>
<td></td>
</tr>
<tr>
<td>improves overtimes.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Incumbents sustaining</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Mainstream Customers divert</td>
<td></td>
<td></td>
</tr>
<tr>
<td>to disruptive innovation</td>
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</table>

MANAGERIAL IMPLICATIONS AND CONCLUSION

Nielsen’s report suggests that innovation is not an easy process, as it seems the success rate of new innovation is only 0.46% (Christensen et al., 2016). Consequently Shane (2008) contends that the commercialisation of new innovation is challenging, and this creates even more hurdles for start ups because the majority of them fail in less than five years. On the other hand, some start ups
are more successful than others, such as Tesla, Transfer wise, Airbnb, Deliveroo and others. These businesses conceivably may have something in common that makes them successful, which is very thoughtful and can be used for the success of other start ups. On the other hand, entrepreneurs play a very important role in changing industries, yet the extent of success is limited (Schumpeter, 1934). Thus, the attraction of entrepreneurship has driven practitioners to focus on introducing innovations that are superior and can potentially disrupt the market (Vazquez Sampere, 2016). There are several examples of superior innovation replacing inferior innovation, such as candles being replaced by electricity, aircraft taking over from cruises and cellular phones over landlines. In the late 1970s, low-cost inferior goods with incremental innovation represented a new trend, which transformed many industries (Vazquez Sampere, 2017). This is also evident in Christensen’s (1997) work on disruptive innovation. He suggested that low cost goods are not seen as a threat by existing firms since they have sufficient time and no competition pressure to focus on improving themselves and disrupting the market as they improve over time.

On the other hand, the findings present a list of different categories of innovation typologies. However, the nature of these innovations is defined by either minor improvements or dramatic change, which can be categorised into either incremental innovation or radical innovation. Hence, it can be argued that radical innovation can enter from either side to disrupt the market. The example of iPhone is salient here. This product represented a radical change in comparison to Sony Walkman, and disrupted the market from the higher-end. Consequently, the existing theory of disruptive innovation is limited to disruptive innovation at the lower end of the market and this represents a gap in knowledge. This study seeks to fill this gap by consolidating all kinds of markets for radical changes and disruption, which imply, manager can use these different kind of strategies to achieve competitive advantage and create disruptive innovation from either side of the market.

References


A CONCEPTUAL FRAMEWORK FOR SMARTPHONE SECURITY AMONG ARAB MILLENNIALS

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Abstract

The rapid growth of smartphone adoption and use in the Middle East has led to some critical post-adoption issues, including ensuring that smartphones are used securely. Moreover, there is a gap in the existing literature on the perceptions and behaviour of individual consumers, especially millennials, in relation to mobile security and dealing with smartphone security threats. Little research on this subject has been carried out in developing countries, particularly in the Middle East, in a cross-national context. Therefore, this research aims to analyse the factors that can affect smartphone security behaviour among millennials in a cross-national context in the Middle East. The model developed in this research is based on a combination of the protection motivation theory (PMT) and the extended unified theory of acceptance and use of technology (UTAUT2), with additional factors specifically related to millennials’ smartphone security behaviour in the Middle East. The initial findings indicate that (1) there is a gap in research on the security behaviour of Arab millennials, despite the existence of serious security threats associated with their use of these technologies; and (2) there is a gap in research on similarities and differences in smartphone security behaviour among consumers in a cross-national context. A questionnaire will be distributed online to consumers who are 18–29 years old in Iraq, Jordan and the UAE. This is the first research to study millennial Arabs’ security behaviour around smartphones and mobile applications in a cross-national context. In addition, the conceptual framework proposed in this research combines the PMT and the UTAUT2, with a further extension via the inclusion of three additional factors: privacy concerns; security threats related to smartphone-specific characteristics; and cybersecurity acculturation. Furthermore, this research bridges the gap in knowledge in terms of addressing the lack of research on millennials smartphone users in the Middle East region as they form the largest segment of the population.

Keywords Smartphone security behaviour, Middle East, UTAUT2, PMT, Arab culture

1. INTRODUCTION

With the growing use of smartphones and mobile applications, there is a need to protect consumers’ data to ensure that people continue to use these technologies safely. It is anticipated that by 2020, almost three-quarters of the global population will benefit from a mobile subscription (GSMA, 2017). The individual mobile user is able to access various mobile services, such as m-health, m-learning, m-commerce, m-money and m-banking. Given the sensitivity of the information provided and used by individuals on smartphones, it is important to study issues related to data protection and cybersecurity attacks. The number of fraud attempts made through mobile channels is dramatically increasing (O’Driscoll, 2018) and these attempts are expected to continue evolving (Cybersecurity Ventures, 2017). In 2017, mobile applications were downloaded a total of 197 billion times (Statista, 2018). The high use of smartphones, along with the large amount of valuable and private information they hold, makes them attractive to attackers who are interested in exploiting the devices to obtain private information (Bitten et al., 2018). One of the most challenging trends in mobile security is that individuals do not fully understand the risks inherent in using mobile devices. Mobile applications are widely varied and often poorly understood, particularly their actions and functions related to privacy and security.
Users of smartphone devices play an important role in ensuring information is kept secure when using smartphones. These vulnerable devices can jeopardise the confidentiality, integrity and availability of individuals’ sensitive data. While smartphones offer huge opportunities for positive experiences, threats to users’ security and privacy emerge at the same time. Those include malicious apps, data loss, surveillance and profiling, to name just a few (Okeke and Shah, 2016; Kraus et al., 2017). As a high number of mobile applications are available freely, mobile users often use them without paying attention to the security aspects.

Young Arabs aged 18–29 years (millennials) are active users of smartphones and mobile applications (Ameen et al., 2018a; Ameen and Willis, 2018a; Ameen and Willis, 2018b). In fact, they are the most engaged consumers in using new technologies. The security threats for this particular age group are more serious than for the other age groups. Hence, studying their behaviour in terms of ensuring the secure use of smartphones and mobile applications is important. Moreover, this particular segment of smartphone users can influence the security behaviour of other (younger or older) consumers. Despite the fact that the literature is rich in studies of online security behaviour, little is known about the context of perceptions and behaviour relating to mobile security among individual consumers in developing countries. In addition, there is inadequate research about millennials’ behaviour in dealing with mobile (smartphone) security threats, particularly in the Middle East in a cross-national context. In order to bridge this gap, this research develops a theoretical model on consumers’ protective behaviour in relation to mobile security threats. Hence, the main aim of this research is to analyse the factors that can affect smartphone security behaviour among millennials in a cross-national context in the Middle East.

This research contributes to the existing knowledge in terms of both theory and practice. First, this is the first research that studies young Arabs’ security behaviour around smartphones and mobile applications in a cross-national context. Second, the conceptual framework proposed in this research combines the extended unified theory of acceptance and use of technology (UTAUT2) and the protection motivation theory (PMT), with a further extension via the inclusion of three additional factors: privacy concerns; smartphone-specific features security threats; and cybersecurity acculturation. Third, the research bridges the knowledge gap by addressing the lack of research on young smartphone users in the Middle East region, who form the largest segment of the population in the region. In addition, the research highlights important aspects related to smartphone security behaviour among millennials in the Middle East, which has important implications for policy makers in the region in terms of policy- making and developing new training programmes targeted at young smartphone consumers in the region.

2. LITERATURE REVIEW

2.1 Smartphone security threats in the Middle East

As their use increases, mobile internet in the Middle East and e-commerce transactions are becoming major targets for cybercriminals (Aboul-Enein, 2017). The smartphone penetration rate is increasing rapidly in the region, ranging from 30% in some Arab countries to 99% in the UAE (Statista, 2017). The extensive and rapid penetration of smartphones and the mobile internet is attracting cyber criminals, leading to a rapid increase in the number of attempted cybercrime in the region (Radcliffe and Sink, 2018).

The Middle East is considered at a high security risk in terms of cybersecurity due to many factors related to technology, people, governance and processes (PWC, 2016). The PWC 2016 report explains that companies in the Middle East are relying heavily on technology to fix cybersecurity issues, while the real concern is human error. Previous studies explained that
smartphones pose major cybersecurity threats due to the large amount of sensitive data that can be gathered through the use of mobile internet and mobile applications (O’Driscoll, 2018). Bitton et al. (2018) categorised mobile security into four main areas of focus: mobile applications (application installation and application handling); browsing and communication (browser, virtual communication and accounts); communication channels (networks and physical channels); and devices (operating system, data privacy and security systems). There are many types of mobile attacks that individuals may encounter. Examples include the following: phishing attacks (via e-mail, websites, forums and social network fraud, such as fake links, friend or game requests); application attacks (notifications, such as error messages, in-app pop-ups, malicious advertisements, clicking fraud, trojan applications and rootkits); and weak authentication attacks (due to password-cracking, password reuse, default passwords, and no screen lock) (Bitton et al., 2018).

The extant literature highlighted the importance of human security behaviour (e.g. Hui et al., 2017; Venkatesh et al., 2017; Moody et al., 2018). While the majority of previous research focused on individuals’ online security (e.g. Choi et al., 2018; Gratian et al., 2018; McCormac et al., 2017), only a limited number of studies have focused on the socio-cognitive behaviours that affect mobile security practices and security behaviour (e.g. Allam et al., 2014; Masrek et al. 2017; Ophoff and Robinson, 2014). The skills required from a mobile user to interact safely with his or her smartphone are different from those that are required for safe and responsible PC use (Bitton et al., 2018). Compared with desktop users, mobile device users are at least three times more vulnerable to phishing attacks (Kessem, 2012). Some of the reasons for this vulnerability are small screen size, lack of identity indicators, inconvenience of user input, switching between applications, and the habits and preferences of mobile device users. Hence, studying the behaviour of mobile users is essential (Goel and Jain, 2018).

2.2 Cybersecurity behaviour theories

The existing literature is rich with theories used to study individuals’ security behaviour. These include the PMT (Rogers, 1975; 1983; Maddux and Rogers, 1983), general deterrence theory (Gibbs 1975), rational choice theory (Becker, 1968), neutralisation theory (Sykes and Matza, 1957), the theory of reasoned action (Fishbein and Ajzen, 1975; Ajzen and Fishbein, 1980), the theory of planned behaviour (Ajzen, 1985; 1991), social cognitive theory (Bandura, 1986) and social learning theory (Miller and Dollard, 1941). However, these theories focused on the behaviour of employees in an organisational context rather than on consumers in a voluntary setting.

The PMT was developed by Rogers (1975; 1983) and Maddux and Rogers (1983). The theory stems from both the threat appraisal and the coping appraisal. The theory has been applied in the context of employee awareness of organisational policies on information security (Herath and Rao, 2009; Siponen et al., 2010) and individual use of security software (Johnston and Warkentin, 2010). However, the application of this theory in the context of millennials’ smartphone security behaviour in a voluntary setting is limited. The theory integrated four main factors: perceived risk vulnerability; severity of the adverse consequences; perceived response efficacy; and response cost (Rogers, 1975; 1983; Maddux and Rogers, 1983). Table 1 shows examples of the most recent studies that used or extended the PMT in the area of cybersecurity behaviour.
### Table 1. Examples of most recent studies that used or extended the PMT

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Country</th>
<th>Context</th>
<th>Methodology</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tsai et al. (2016)</td>
<td>United States</td>
<td>Amazon Mechanical Turk (MTurk)</td>
<td>An online survey was used to collect data. 988 usable responses were used in the work.</td>
<td>Coping appraisal variables were the strongest predictors of online safety intentions, especially habit strength, response efficacy, and personal responsibility. Threat severity was also a significant predictor.</td>
</tr>
<tr>
<td>Boss et al. (2015)</td>
<td>United States</td>
<td>Operating System environment</td>
<td>A field experiment was used in this study. 125 students participated in study 1. 327 students participated in study 2.</td>
<td>Fear and maladaptive rewards play a significant role in determining protection motivation.</td>
</tr>
<tr>
<td>Dang-Pham And Pittayachawan (2015)</td>
<td>Australia</td>
<td>Avoiding malware in Bring Your Own Device in a university Setting</td>
<td>A questionnaire was used. 252 usable responses were used in the analysis.</td>
<td>Intention to perform malware avoidance behaviour differed across the contexts. Furthermore, perceptions of self-efficacy and vulnerability had different impacts on such intention and other variables in the model.</td>
</tr>
<tr>
<td>Moody et al. (2018)</td>
<td>Finland</td>
<td>Security systems in organisations</td>
<td>A questionnaire was used. 274 usable responses were used for study 1. 393 usable responses were used in study 2.</td>
<td>Response efficacy, threat, habit, role values, fear, neutralisation and reactance are important factors for information systems security.</td>
</tr>
<tr>
<td>Gao et al. (2018)</td>
<td>China</td>
<td>Smartphone-based social network service (SNS)</td>
<td>An online survey was used. 528 usable responses were used in the analysis.</td>
<td>Ubiquitous connectivity could increase SNS users’ discontinuous usage intention though raising privacy concerns and protection motivation, and through aggravating their information overload and SNS exhaustion.</td>
</tr>
<tr>
<td>Jansen and van Schaik (2018)</td>
<td>General internet users</td>
<td>Phishing attacks on the internet</td>
<td>A pre-test post-test design was used. In the pre-test, 1,201 internet users filled out an online survey. In the post-test, data were collected from 786 internet users.</td>
<td>The study found that PMT model relations hold in the domain of phishing. Self-efficacy and fear were the most important predictors of protection motivation.</td>
</tr>
</tbody>
</table>

The first version of UTAUT was developed by Venkatesh et al. (2003). The authors found similarities among the constructs used in previous theories. The model was built by comparing and testing eight main technology acceptance theories: the theory of reasoned action (Fishbein and Ajzen, 1975; Ajzen and Fishbein, 1980), the technology acceptance model (TAM) (Davis, 1989), the motivational model, the theory of planned behaviour (TPB) (Ajzen, 1985; 1991), the
combined TAM and TPB (Taylor and Todd, 1995), the model of PC utilisation (Thompson et al., 1994), diffusion of innovation theory (Rogers, 2003) and social cognitive theory (Bandura, 1986). The extended UTAUT (Venkatesh et al., 2012) was an extension of this theory fit the context of consumers’ adoption and use of technology in a voluntary setting. The model integrated the factors: performance expectancy, effort expectancy, social influence, facilitating conditions, price value, habit, behavioural intention and actual use. The theory has been used to study the adoption of different technologies in different contexts including cybersecurity behaviour (Bikoro et al., 2018). Table 2 shows examples of the most recent and relevant studies in the context of mobile cybersecurity behaviour.

**Table 2. Examples of most recent studies on smartphone cybersecurity behaviour in the Middle East**

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Country</th>
<th>Context</th>
<th>Methodology</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baabdullah et al. (2015)</td>
<td>Saudi Arabia</td>
<td>Mobile government</td>
<td>Questionnaires were distributed in three cities in Saudi Arabia. 418 usable responses were included in the analysis.</td>
<td>Perceived risk is an important factor determining the use of mobile government. Personal identification numbers (PINs) do not provide very high security because they can be guessed.</td>
</tr>
<tr>
<td>Alasmari (2017)</td>
<td>Saudi Arabia</td>
<td>Mobile learning</td>
<td>1,203 usable responses from questionnaires were included in the quantitative analysis.</td>
<td>Security and privacy of online learning are important to motivate students to use the online platform. These two factors were major influences affecting students’ use of the e-learning platform.</td>
</tr>
<tr>
<td>Alalawan et al. (2017)</td>
<td>Jordan</td>
<td>Mobile banking</td>
<td>Questionnaires were completed by participants. 343 usable responses were included in the analysis.</td>
<td>Trust and perceived risk are major factors affecting customers’ use of mobile banking. In addition, the security issues associated with mobile banking are more complicated than online banking.</td>
</tr>
<tr>
<td>Alkhaldi (2017)</td>
<td>Saudi Arabia</td>
<td>Mobile banking</td>
<td>Questionnaires were completed by banking customers in Saudi Arabia. 389 usable responses were included in the analysis.</td>
<td>Though banks should use SMS banking, e-mails, brochures, and social networks to raise users’ awareness of mobile banking services, such efforts do not help reduce consumers’ perceptions of risk in using mobile banking. Banks should provide adequate protection from privacy violations.</td>
</tr>
<tr>
<td>Baabdullah (2018)</td>
<td>Saudi Arabia</td>
<td>Mobile social network games</td>
<td>A total of 386 questionnaires were used in the analysis.</td>
<td>Trust is an important factor affecting consumers’ use of mobile social games. Consumers are concerned about the security of their information when using these games.</td>
</tr>
</tbody>
</table>
A mixed-method approach was adopted, using both qualitative and quantitative data. For the quantitative part, a total of 306 usable responses were included in the analysis. Reliability, responsiveness and security were major factors affecting the use of mobile payments. The authors described security concerns as highly emotional.

The paper was theoretical. The use of mobile government depends on two types of trust. First, trust in the internet. Second, trust in the government and how it uses data.

Perceived risk is categorised into five main categories: privacy risk, financial risk, time risk, psychological risk and security risk.

The results of these studies highlighted the significance of ensuring the security of the systems they focused on. The results in table 2 reveal a number of gaps in the existing literature. First, there is a lack of research on smartphone cybersecurity behaviour among millennials in the Middle East in a voluntary setting. Second, there is research gap on smartphone security behaviour in a cross-national context in the Middle East. Third, the majority of previous studies focused on cybersecurity behaviour in the areas of mobile banking, financial services and mobile government, despite the fact that security threats are not limited to these technologies. Fourth, there is a lack of research focusing on aspects related to culture (namely, acculturation, specifically cybersecurity acculturation) and smartphone-specific security features. Previous studies highlighted the significant role of acculturation in the use of technology, specifically in developing and emerging countries (Straub et al., 2001; Loch et al., 2003). Hence, acculturation can also play a significant role in smartphone security behaviour. In addition, Tu and Yuan (2015) explained that wireless devices, including smartphones, have specific features that bring new security risks to organisations. Hence, the features specific to smartphones can lead to increased risk for individuals.

3 CONCEPTUAL FRAMEWORK

The model proposed in the present study combines the main constructs of the UTAUT2 and the constructs from the PMT. The constructs of the UTAUT2 are as follows: effort expectancy; habit; price value; facilitating conditions; social influence; hedonic motivation; and behavioural intention (measurement items adapted from Venkatesh et al. (2012)). The constructs from the PMT are as follows: perceived risk vulnerability; severity of the adverse consequences; perceived response efficacy; and response cost (measurement items adapted from studies by Woon et al. (2005), Thompson et al. (2017) and Verkijika (2018)). In addition, three new factors that were found to be important in the case of mobile phone security have been integrated: cybersecurity acculturation (measurement items adapted from Straub et al. (2001) and Ameen and Willis (2018a)); privacy concerns (measurement items adapted from Dinev and Hart (2004, 2006)) and smartphone-specific features security threats (measurement items adapted from Tu and Yuan (2015), Dimensional Research (2017) and Becher and Freiling.

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Country</th>
<th>Area</th>
<th>Methodology</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ramadan and Aita (2018)</td>
<td>Syria</td>
<td>Mobile payment usage</td>
<td>A mixed-method approach was adopted, using both qualitative and quantitative data. For the quantitative part, a total of 306 usable responses were included in the analysis.</td>
<td>Reliability, responsiveness and security were major factors affecting the use of mobile payments. The authors described security concerns as highly emotional.</td>
</tr>
<tr>
<td>Alomari (2018)</td>
<td>Jordan</td>
<td>Mobile government</td>
<td>The paper was theoretical.</td>
<td>The use of mobile government depends on two types of trust. First, trust in the internet. Second, trust in the government and how it uses data.</td>
</tr>
<tr>
<td>Mutahar et al. (2018)</td>
<td>Yemen</td>
<td>Mobile banking</td>
<td>482 usable responses were included in the analysis.</td>
<td>Perceived risk is categorised into five main categories: privacy risk, financial risk, time risk, psychological risk and security risk.</td>
</tr>
</tbody>
</table>
(2011)). Some items have been added by the authors to fit the context of mobile security in the Middle East. The factors integrated in the model and the proposed hypotheses for their significance are discussed in the following sections.

3.1 **Acculturation (cybersecurity acculturation)**

Cybersecurity acculturation refers to inculcating best practices, good habits and behaviours on good and safe use of smartphones (Hashim, 2011). Previous studies emphasised the significance of acculturation: when smartphone users travel to more technologically advanced countries, this influences their use of the device and its mobile applications (Ameen and Willis, 2018a). It also refers to national strategy for cybersecurity acculturation and capacity building programmes (NACSA, 2018). The Middle East lags behind more developed regions in terms of security awareness (Aboul-Enein, 2017). Therefore, cybersecurity acculturation can have a significant effect on millennials’ behavioural intention towards their actual security behaviour. Thus:

H1. Cybersecurity acculturation will have a significant positive effect on behavioural intention towards smartphone security behaviour.

3.2 **Perceived vulnerability**

Perceived vulnerability refers to one’s perception of experiencing possible negative consequences of performing a risky behaviour (Rogers, 1983; Salleh et al., 2012). Crossler (2010) describes perceived vulnerability as the personal probability or likelihood of a security incident occurring and defines perceived severity as the impact of consequences resulting from a security incident. As millennials in the Middle East use smartphones and mobile applications frequently (Ameen et al., 2018a; Ameen et al., 2018b), their perceptions regarding the probability of encountering a security attack increase. Thus, it is hypothesised:

H2. Perceived vulnerability will have a significant positive effect on behavioural intention towards smartphone security behaviour.

3.3 **Severity of adverse consequences**

Perceived severity of adverse consequences refers to one’s perception of the level of damage that may result from engaging in a risky situation (Rogers, 1983; Salleh et al., 2012). For a young user of smartphones and mobile applications, it is important to understand the consequences of any security negligence when using a smartphone. Hence, perceived severity of adverse consequences can have a strong effect on behavioural intention. Thus, it is hypothesised:

H3. Perceived severity of adverse consequences will have a significant positive effect on behavioural intention towards smartphone security behaviour.

3.4 **Perceived response efficacy**

Perceived response efficacy refers to the degree to which an individual believes that the response one takes is effective in alleviating the threat (Rogers, 1983; La Rose et al., 2006). The inclusion of response efficacy in any fear-appeal communication is of the utmost importance (La Rose et al., 2006). Security response efficacy means the beliefs regarding
whether the recommended preventive response will be effective in avoiding or reducing security threats. For example, anti-virus software has been reported as an effective and efficient solution for detecting and preventing virus threats. Thus, a young smartphone user in an Arab country can assume that installing anti-virus software will provide the mobile user with confidence that this solution will prevent or mitigate the security threat (Al-Ghaith, 2016). Therefore, it is hypothesised:

H4. Perceived response efficacy will have a significant positive effect on behavioural intention towards smartphone security behaviour.

3.5 Response cost
Response cost refers to the cost of performing the recommended behaviour (Rogers, 1983). Response cost negatively influences individuals’ intention to adopt adaptive behaviours. For a young smartphone consumer in the Middle East, response cost can have a negative effect on behavioural intention towards smartphone security behaviour. Thus:

H5. Response cost will have a significant negative effect on behavioural intention towards smartphone security behaviour.

3.6 Privacy concerns
This factor refers to the individual’s privacy concerns, which have been highlighted in previous studies (e.g. Lian and Lin 2008; Sims and Xu, 2012; Tucker, 2014; Krafft et al., 2017). A recent GDPR report showed that consumers are becoming concerned about their privacy when using mobile applications (GDPR, 2018). However, consumers are not acting on their privacy concerns when using mobile applications (GDPR, 2018). The situation is similar in the Middle East (Al-Ghaith, 2016), as consumers do not check the permissions of their pre-installed mobile apps on their Android or iOS devices. Thus:

H6. Privacy concerns will have a significant negative effect on behavioural intention towards smartphone security behaviour.

3.7 Smartphone-specific features security threats
Previous studies highlighted that the threats associated with the use of smartphones exceed those associated with the use of desktop computers (Tu and Yuan, 2015; Al-Ghaith, 2016). This is due to features that are specific to smartphones, such as the risk of physically losing the device, the ability to connect to different networks, the use of different mobile applications, data breaches, the mixed use of smartphones for personal and business purposes, the use of free mobile apps that share personal information, the ability to make payments through the device, the battery life, the integrated camera, and the integration of mobile messaging apps (e.g., Viber, Skype and WhatsApp). Thus, it is hypothesised:

H7. Smartphone-specific features security threats will have a significant negative effect on behavioural intention towards smartphone security behaviour.
3.8 Performance expectancy
Performance expectancy refers to “the degree to which using a technology will provide benefits to consumers in performing certain activities” (Venkatesh et al., 2012). This factor was significant in previous studies related to the use of smartphones and mobile applications (Ameen et al., 2018a; Ameen and Willis, 2018a). Understanding the benefits of ensuring the security of a smartphone and its mobile applications can have a significant positive effect on behavioural intention. Thus:

H8. Performance expectancy will have a significant positive effect on behavioural intention towards smartphone security behaviour.

3.9 Effort expectancy
Effort expectancy refers to “the degree of ease associated with consumers’ use of technology” (Venkatesh et al., 2012). Effort expectancy is an important antecedent to behavioural intention towards security behaviour when using different technologies (Iskandar, 2017). The easier the methods used to ensure that the smartphone is secure, the more likely it is that the individual user will ensure its security. Therefore:

H9. Effort expectancy will have a significant positive effect on behavioural intention towards smartphone security behaviour.

3.10 Price value
Price value is defined as “consumers’ cognitive trade-off between the perceived benefits of the applications and the monetary cost for using them” (Venkatesh et al., 2012). This factor refers to consumers’ evaluation of the cost associated with ensuring the security of their smartphones in comparison with the benefits of doing so. If the benefits of security outweigh the cost, price value will be positive (Ameen et al., 2018a). However, the price of anti-virus and smartphone security for Android and Apple iOS may be considered high by some consumers. Thus:

H10. Price value will have a significant positive effect on behavioural intention towards smartphone security behaviour.

3.11 Habit
Limayem et al. (2007) define habit as “the extent to which people tend to perform behaviours automatically because of learning”. Venkatesh et al. (2012) emphasised the importance of habit as a predictor of both behavioural intention and actual use of technology. Given that the Middle East generally lags behind in terms of cybersecurity behaviour with regard to mobile phones and other technologies (Aboul-Enein, 2017), smartphone users may not have developed strong habits related to the security of their smartphones and mobile applications. Thus:

H11. Habit will have an insignificant positive effect on behavioural intention towards smartphone security behaviour.

H12. Habit will have an insignificant positive effect on actual smartphone security behaviour.
3.12 Social influence
Social influence refers to “the extent to which consumers perceive that important others (e.g., family and friends) believe they should use a particular technology” (Venkatesh et al., 2012). The influence of friends and family members can have a significant impact on keeping one’s smartphone and mobile applications secure (Das, 2014). There is a contradiction in the existing literature in terms of the significance of social influence: while earlier studies found that social influence has an effect on technology adoption and usage behaviour (Das, 2014), a more recent study (Ameen and Willis, 2018) found that this factor does not have a significant effect on the use of smartphones or mobile applications in Iraq, Jordan or the United Arab Emirates. In this research, the following hypothesis is proposed:

H13. Social influence will have a significant positive effect on behavioural intention towards smartphone security behaviour.

3.13 Facilitating conditions
Facilitating conditions refer to “consumers’ perceptions of the resources and support available to perform a behaviour” (Venkatesh et al., 2012). They represent the resources available to consumers to ensure the secure use of smartphones and mobile applications. These resources take the form of educational materials, information available to the individual, help obtained from others to aid an individual’s learning on how to use technology, and whether or not ensuring the security of smartphones and mobile applications is compatible with ensuring the security of other technologies the individual is using. Hence, this factor links to compatibility and ease of use (Venkatesh et al., 2003). Thus:

H14. Facilitating conditions will have a significant positive effect on behavioural intention towards smartphone security behaviour.

3.14 Behavioural intention
Behavioural intention refers to the process of the individual’s readiness (cognitively) to perform a certain behaviour (Ajzen and Fishbein, 1980). Accordingly, the likelihood of a person performing a certain behaviour depends on their intentions (Ajzen and Fishbein, 1980). In this study, we hypothesise that behavioural intention will have a significant effect on actual smartphone security behaviour:

H15. Behavioural intention will have a significant positive effect on actual smartphone security behaviour.

Figure 1 shows the research model developed in this study.
4 METHODOLOGY

The research will test the model in three different Middle Eastern countries: Iraq, Jordan and the UAE. It will explore the differences between the three countries. These three countries are ranked differently in the Global Cybersecurity Index (2017): the UAE is ranked as 47th globally, while Jordan and Iraq are ranked 93rd and 159th respectively (International Telecommunication Union, 2017). We are studying the behaviour of mobile users in these three countries because they represent the exemplars of distinct contextual difference. Data will be collected from millennials in Iraq, Jordan and the UAE through an online questionnaire using random sampling. The link will be distributed through social media platforms and mobile phones (using SMS and VoIP applications such as Viber and WhatsApp) to enable participants to complete the questionnaire. The authors will endeavour to obtain a total of 533 completed questionnaires from each country from young adults aged 18–29 years. The collected data will be analysed using partial least squares-structural equation modelling (PLS-SEM). Both Statistical Package for the Social Sciences (SPSS) and SmartPLS software will be used to analyse the data.

5 INITIAL FINDINGS

This research aims to analyse the factors that can affect smartphone security behaviour among millennials in the Middle East. The review of the existing literature on mobile security revealed a
number of findings. Despite the growth of cybersecurity crimes and their threats to the security and privacy of individuals’ information, there is a lack of research in this area. Previous studies identified factors such as trust, perceived risk, security and privacy as important for the use of various individual mobile applications (e.g. Alasmari, 2017; Alkhaldi, 2017; Alomari, 2018). However, there is a gap in the existing knowledge about the security behaviour of young active users of smartphones.

The conceptual framework developed in this research combines two well-known theories: the UTAUT2 (Venkatesh et al., 2012) and the PMT (Rogers, 1975, 1983; Maddux and Rogers, 1983). Existing studies used a combination of factors to study the security behaviour of individuals in voluntary and organisational settings. Nevertheless, the unique characteristics of smartphones and mobile applications make ensuring their security more challenging than ensuring the security of other technologies (Shah, 2013). Hence, it is important to integrate the factors that are specifically related to security behaviour when using smartphones. In addition, investigating the level of cybersecurity awareness and its effect (acculturation) is important in order to assess the effectiveness of cybersecurity awareness campaigns and their influence on individuals’ smartphone security behaviour.

6 RESEARCH CONTRIBUTIONS AND IMPLICATIONATIONS

This research will contribute to the existing knowledge in terms of both theory and practice. First, this is the first research to study young people’s security behaviour with regard to smartphones and mobile applications in a cross-national context in the Middle East. Second, the conceptual framework proposed in this research combines the UTAUT2 and the PMT, with a further extension via the inclusion of three additional factors: privacy concerns; smartphone-specific features security threats; and cybersecurity acculturation. Third, the research will bridge the knowledge gap in terms of addressing the lack of research on young smartphone users in the Middle East region, who form the largest segment of the population.

In terms of the practical contributions, it is anticipated that the results of this research will help to identify new issues in terms of policy-making and the development of new training programmes related to smartphone cybersecurity in the Middle East, as the research is cross-national. Indeed, the development of more effective policies and the enhancement of a more cybersecurity-aware culture in the Middle East are expected to be two major practical contributions made by this research.

7 CONCLUSIONS, LIMITATIONS AND FUTURE RESEARCH

A conceptual framework was developed in this research to identify and examine the potential factors that affect Arab millennials’ security behaviour when using smartphones and mobile applications. The initial findings, based on a review of the existing literature, indicate that there is a gap in this area of research. Hence, this study proposes a new conceptual framework that integrates the PMT and the UTAUT, along with other factors specific to ensuring the security of smartphones and mobile applications. Hence, once the empirical work has been completed, the study will provide both theoretical and practical contributions.

Despite the significance of this study, it has some limitations. One of the main limitations at this stage is the lack of empirical work to validate and test the proposed model among young
smartphone users in Iraq, Jordan and UAE. Data will be collected from the three countries to validate the proposed model. In addition, the model proposed in this research is complex. However, this reflects the complexity of the phenomenon of smartphone cybersecurity behaviour and cybersecurity crime committed through these devices. The findings of this research will be limited to three countries in the Middle East. Future studies can collect data from other countries to provide an empirical validation of the proposed model. In addition, future studies should investigate other factors related to the effects of culture on cybersecurity behaviour in the Middle East.

REFERENCES


Dimensional Research (2017). The growing threat of mobile device security breaches a global


BUSINESS MODEL FRAMEWORKS IN IOT CONTEXT – A LITERATURE REVIEW

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Abstract

Employing the Internet of Things (IoT) in business changes the way in which value is offered to customers. To enable and ensure effective value exchange, proper business models are required. In this literature review study (n=56), business model frameworks created for the IoT context were evaluated. The results show that although most of the frameworks emphasize the ecosystemic nature of IoT, even they still largely do not describe the connections, dynamics, and causality between the business model components. While IoT as such does not necessarily need a specific business model, the ecosystemic nature of IoT is bound to influence the business model, thus making IoT business models more integrative, inter-relational, and complex. The results also suggest that the ecosystem-level co-creation of business models needs to be emphasized and studied further.

Keywords: Internet of Things; IoT; Business Model; Literature review; Case study

1. Introduction

The “Internet of Things” (IoT) is expected to have a significant effect on businesses. Based on the amount of public discussion around the subject, it can be assumed there is also a strong market interest in IoT (see e.g. [https://www.iotone.com/](https://www.iotone.com/)). IoT is becoming the backbone of value provision for customers (Vermesan and Friess, 2014). The only requirement to enable the prosperity of IoT businesses is proper business models. This study seeks to create an understanding of how business model development in the IoT context differs from the traditional ways to conduct business, since the technology to enable IoT-driven business already exists.
The IoT creates opportunities for new types of business, new services, and pressure to increase collaboration across industries and to enhance openness (Ju et al., 2016). This complicates the current firm-level business models since it creates a need for an ecosystem-level business model. Simultaneously, it should be kept in mind that disruptive technologies, such as IoT might be, affect our social structure and create new social and even political opportunities (Benkler, 2006). In the past, business models were linked in two integrated streams – the money stream and the product stream (Glova et al., 2014). Today, this is no longer the case. There is an infinite number of different ways to connect customers, physical or virtual “things,” and businesses together (Westerlund et al., 2014). However, the IoT may help to align the physical product stream, the information stream, and the money stream by enhancing and improving visibility and control (Glova et al., 2014).

The IoT has been studied since the early 2000s (see Mejtoft, 2011); yet little research has been carried out that focuses on IoT-related business models (Whitmore et al., 2015). Before a technology can succeed, three factors have to be present: the technology itself has to be available, there has to be a strong market demand, and business models have to be established to link the supply and demand (Palattella et al., 2016).

The digital transformation enabled by IoT will fundamentally change business models towards as-a-service concepts, increasing customer involvement as well as turning data into value, thus finally converting traditional modes of cooperation into complex ecosystems (Pflaum and Gölzer, 2018).

This literature study provides the reader with the opportunity to understand how IoT-enabled business model development differs from traditional business model development, and how IoT business model development is linked with the actual development process in practice. We start by reviewing the current definitions of IoT and the business model, and continue by describing the research method in more detail. After these theoretical sections, we analyse the findings and conclude with a discussion, envisioning paths for future research.
2. Current definitions and their shortcomings

The terms ‘business model’ and ‘IoT’ have several different definitions, none of which seem to be widely accepted by the academic community. The inadequate consensus on the definitions impedes scholars attempting to describe the phenomena and their attributes (Podsakoff et al., 2016). In the next paragraphs, we illustrate the conceptual development and define the key terms for this literature study. The IoT and business model may not be “wicked problems” (Rittel and Webber, 1984) as they can be defined; until now the lack of consensus on a definition has made it challenging to measure the success of different business models in a certain context and create cumulative knowledge (Foss and Saebi, 2018). The same applies to developing IoT solutions. It can be stated that this vagueness hinders the development of a feasible and comprehensive IoT-enabled business.

2.1. Business model

Understanding the purpose of a business model is an increasing trend in research (Westerlund et al., 2014). Traditionally, business models have been described by defining the value proposition, value creation, and value capture (Burmeister et al., 2016); hence, this study examines whether the same principles also apply in the IoT context. It is fair to say there is no common consensus on the definition of a business model (Laudien and Pesch, 2018). We agree with Foss and Saebi (2018) that the heterogeneity of definitions and the lack of construct clarity of the business model causes deficiencies in the cumulativeness of the business model theory, which in turn complicates empirical testing. In this study, we compared 13 different frameworks for defining a business model (see Appendix 1).

In the early days of business model research, the future views of electronic markets were included in the business model definition: “A business model depicts the content, structure, and governance of transactions designed so as to create value through the exploitation of business opportunities” (Amit and Zott, 2001, p. 511). Nearly ten years later, Teece (2010, p. 173) posited that a business model “articulates the logic and provides data and other evidence that demonstrate how a business creates and delivers value to customers. It also outlines the architecture of revenues, costs, and profits.
associated with the business enterprise delivering that value.” Both of the definitions emphasize, however, that the business model is a firm-centric concept. In 2012, Leminen et al. (2012) recognized a research gap related to IoT business models. At that time, IoT applications were context-specific. Leminen et al. perceived the connection between the development of domains (such as consumer electronics or factory automation) and market expansion, leading to the embracing of the term ecosystems. Thus, they argued that there was a need to define business models at the ecosystem level. One of the shortest definitions of a business model has been presented by Muegge (2012). He claimed that the business model is the story of how a business works. This is a concise, easy to remember definition, but does not give any particular details on what to include when creating a business model. In 2013, Li and Xu (2013) proposed that “the business model should be a bridge between technology and economy, which can guarantee the sustainable development of the industry.”

For the purposes of this study, we chose a relatively old definition by Weil and Vitale (2001), which has stood the test of time well. It defines a business model to be “a description of the roles and relationships among a firm’s consumers, customers, allies, and suppliers that identifies the major flows of product, information, and money, and the major benefits to participants” (Weill and Vitale, 2001, p. 34). It includes the ecosystemic paradigm, unlike many later definitions. In addition to what a business model is, it also describes what the business model is for, i.e. what can be accomplished with it. Although the definition can be seen as firm-centric, it can also be interpreted as referring to “allies,” which thus broadens the definition to cover the ecosystem. The benefits from IoT are based on co-creation of value (D’Souza et al., 2015; Ikaävalko and Turkama, 2018; Ju et al., 2016); thus the business model definition should include the ecosystem paradigm.

2.2. The Internet of Things

The definition of IoT is at least as diverse as was the case for business models in the previous section. In our study, we have identified 40 different definitions (will be provided upon request). In 2005, the International Telecommunications Union implied that connectivity for anyone, at any time, and in any place would be supplemented with connectivity for anything (Itu, 2005). In 2009, the Cluster of European Research
Projects on the Internet of Things (CERP-IoT) published the following definition of IoT: “a dynamic global network infrastructure with self-configuring capabilities based on standard and interoperable communication protocols where physical and virtual “things” have identities, physical attributes, and virtual personalities and use intelligent interfaces, and are seamlessly integrated into the information network.” (Vermesan et al., 2009, p. 6). Notably, their definition also included the definition of a “thing”, which is “a real/physical or digital/virtual entity that exists and moves in space and time and is capable of being identified.” The IoT definition of CERP-IoT emphasizes the infrastructure. Minerva et al. (2015, p. 74) created what they called an all-inclusive definition: “Internet of Things envisions a self-configuring, adaptive, complex network that interconnects 'things' to the Internet through the use of standard communication protocols. The interconnected things have physical or virtual representation in the digital world, sensing/actuation capability, a programmability feature and are uniquely identifiable. The representation contains information including the thing’s identity, status, location or any other business, social or privately relevant information. The things offer services, with or without human intervention, through the exploitation of unique identification, data capture and communication, and actuation capability. The service is exploited through the use of intelligent interfaces and is made available anywhere, anytime, and for anything taking security into consideration.” Based on these definitions, the IoT includes ten elements: physical objects, virtual things, uniqueness, standardized technologies, global availability, interconnection and interaction, information, services and applications, and security. Thus there is no commonly accepted definition of IoT (Dorsemaine et al., 2016). It is worth noting that, based on the definitions above, the IoT itself does not include a business element. Hence, the IoT is considered only as an enabler of business.

3. Research Method

As mentioned in the introduction, there is plenty of variation in the definitions of both “IoT” and “business model” and the analysis of secondary information is conducted by synthesizing the existing literature. Consequently, a meta-synthesis type of literature review (O’Gorman and MacIntosh, 2015) through backward snowballing (Wohlin, 2014) was chosen as the research method. Meta-synthesis differs from the more popular systematic literature review by aiming to attain the next level of understanding and to
develop conceptual understanding further. This is done by combining interpretive, eclectic, and hermeneutic processes together (Tranfield et al., 2003). It aims to identify all important similarities and differences in the data (Sandelowski et al., 1997). Integrating interpretive qualitative findings leads to the interpretive synthesis of data where the result is more than the sum of the parts (Sandelowski and Barroso, 2007). Hence, meta-synthesis can be considered as a suitable method to study such concepts as IoT and business model, since there is no consensus on definitions.

Backward snowballing is done by exploring publications that are referenced in the starting set of publications (Jalali and Wohlin, 2012). In the starting set, each publication is processed individually. First, all titles of the references are reviewed; the abstract is reviewed unless the title clearly excludes the reference. In cases where the abstract includes potential (referring to frameworks, business models or IoT), the full paper is read and analysed. After this, the references of the references are analysed in a similar manner. This drilling to the next level is continued until nothing new emerges, which in this case was until IoT was no longer included in the references. Google Scholar was selected as the search engine as the aspiration was to achieve as unbiased a starting set as possible and not to rely only on a single publisher or geographical area (Wohlin, 2014). While this study covers IoT – often covered in ICT publications – and business models – typically included in management literature – we had to conduct a search from the widest possible database. Google Scholar (GS) was selected as the search engine since its coverage is considered sufficiently wide (165 million documents according to Orduna-Malea et al., 2015, see also Brophy & Bawden, 2005). However, using GS’s relevance search returns appropriate results (Hariri, 2011) thus the literature starting set was created by making two broad searches (IoT “business model” and IoT AND “business model”). Citations and patents were excluded, because the focus was on scientific research results. The top 20 most relevant publications according to Google Scholar from each search were included in the tentative starting set. GS ranks publications from full text weighted by publisher, writer, and recent citations to academic literature. Most of the publications were the same in both queries, resulting in 25 publications for the initial starting set. The initial starting set included publications from different publishers, geographical areas, years and authors, thus the diversity was considered sufficient (Wohlin, 2014). Two of the publications contained no references; hence they were excluded from the literature review. After snowballing backward to
where IoT was included in the title or abstract of the source, 56 full text sources were identified and analysed. This resulted in the identification of 13 different IoT-related business model development frameworks for analysis.

4. Findings

While the IoT business models require interdisciplinary delineations, full usefulness can be achieved only after a convergence of three paradigms has been realized (Atzori et al., 2010), referring to middleware (that is, internet-oriented), sensors (NFC, RFID etc.; things-oriented) and knowledge (reasoning over data and semantic execution environments; semantics-oriented). These orientations lead to two types of IoT business models: the paid data model and the smart property model, both of which have operating and transaction modes (Zhang and Wen, 2017).

Hui (2014) stated, “Filling out well-known frameworks and streamlining established business models won’t be enough.” With this remark, he was referring to the cloud-based opportunities created by the IoT and the fundamental implications this has for business model innovation in every line of business. Westerlund et al. (2014) support this view. According to their concept, the major deficits in the existing component-based frameworks (such as the Business Model Canvas (Osterwalder and Pigneur, 2010)) neglect to describe the connections and dynamics between the different business model components but focus merely on the model architecture. Sun et al. (2012) support this view by stating that the component-based frameworks do not describe the linkages between cause and effect. Nevertheless, based on the reviewed publications, the Business Model Canvas (BMC) appears to be almost the standard procedure for defining a business model among practitioners.

Since the value proposition, value creation and value capture remain the key elements in any business model (Cheah and Wang, 2017; Sorescu, 2017), we next summarize the key findings of the literature review in terms of these elements. More details are provided in Appendix 2.
4.1. Value Proposition

Notably, Burmeister et al. (2016) emphasize that the value proposition focuses on Business to Business to Consumer (B2B2C), in other words, the complete value chain. Baden-Fuller et al. (2013) state that the value proposition is part of customer engagement. They see the customer as playing a major role in creating content, thus increasing the value of the offering in the form of product extensions. This co-creation of value indicates that current and future business models consist of different types of value and require a system perspective (Romero and Molina, 2011). Westerlund et al. (2014) use the term “value drivers” in their framework to describe the motivations of often diverse participants to enable an ecosystem to be formed. They see value drivers as a means of promoting value generation, innovation realization and creating a non-biased win-win ecosystem. Two papers approach business model innovation and value proposition design with the question “Why?” (Turber et al., 2014; Turber and Smiela, 2014). While this seems to be a very generic question, it offers a straightforward way to understand the meaning of a value proposition. The value proposition is created to answer the question why anyone should join an ecosystem – including the company offering some value, as the reward it receives as value capture is the answer to the question “Why?”.

4.2. Value creation

A commonly acknowledged fact is that data are key ingredients of an IoT-enabled business model. According to Hartman et al. (2016), the five data-related key activities vital for what they call DDBMs (Data Driven Business Models) are the following: 1) selection of the data set, 2) processing and cleaning data, 3) data reduction (or reducing the number of variables by data transformation), 4) data mining to identify data patterns, and 5) data interpretation and visualization of the discovered patterns. Sun et al. (2012) underline the importance of considering all types of data – internal, external, structured and semi-structured – as well as all five types of data sources (operational, dark, commercial, social and public data). Thus, data plays an important role in IoT-enabled business; however, it is hardly the only principal element. Ju et al. (2016) include product development, partner management and platform integration in key activities, and Sun et al. (2012) transportation, among other things.
Westerlund et al. (2014) take an ecosystemic approach to value creation. From their perspective, key activities form a value exchange, which occurs in value networks where tangible and intangible values flow. The value exchange strives to explain “how the engine works,” i.e. how different parts of the value network or ecosystem work together to transfer the resources to add value to its members. Turber et al. (2014) describe value creation with a single word: “What?” and they also answer the question. They proposed that the IoT architectural stack is the source of value creation and value capture among partners. The stack they refer to includes four layers: device, network, service and content layers, based on the research by Yoo et al. (2010). According to Turber et al. (2014), the device layer includes logical capabilities, such as an operating system, which connects the actual physical device to the other layers of the stack. Next, the network layer includes physical transportation and logical transmission (i.e. from transmitters to network standards). Finally, the service layer enables the creation and consumption of the content, which is stored in and shared from the content layer.

Value creation also requires different types of resources. Ju et al. (2016) define the key resources as including sensors, cloud services, an IoT-dedicated network and the capability for business analytics. They also emphasize that changing technologies change the business environment, and hence traditional business models are no longer adequate. Zhang and Wen (2017) propose that the key resources are entities, which in the case of a DAC (Distributed Autonomous Corporation) are the DAC itself and human beings. These resources provide the IoT commodity and are automatically able to search for and purchase IoT products according to certain rules. Westerlund et al. (2014) call key resources value nodes. These nodes include different actors and activities or even automated processes. They may be individuals, commercial or non-profit organizations or groups, networks of organizations, or even networks of networks. In short, the nodes are the entities that create value by being connected to each other and in IoT ecosystems, and there is significant heterogeneity in their nature. Turber et al. (2014) define key resources by asking “Where?” They use this question to spotlight the four-layer architecture – more specifically the layers of the device, connectivity, services and content, where each layer represents a source of opportunities for value creation.
Approximately half of the scholars in our sample emphasize the need to focus on ecosystem-level value creation and capture as well as grasping the integrated value driver (e.g. Ju et al., 2016; Turber and Smiela, 2014; Westerlund et al., 2014). The value chain linkages introduced by Baden-Fuller et al. (2013) highlight the linkages between identifying customer groups and sensing their needs and monetizing the value. These linkages may go far beyond traditional value chains, as IoT tends to have a multi-sided business model (Keskin and Kennedy, 2015).

When comparing the frameworks for instance with the Business Model Canvas type of approaches, it becomes clear that there is no cost structure element. This can be understood since IoT boosts business process modularization as it strives for high scalability and system performance (Balandin, Andreev & Koucheryavy, 2013, p. 18). However, it is essential to remember business viability: the full potential of IoT applications can be reached only if the cost of deploying the solution is low enough (Tarkoma and Ailisto, 2013).

None of the frameworks directly addressed the challenge of balancing openness and autonomy in business ecosystems. Moore wrote about collective destiny in ecosystems. His view was that a completely new kind of competitive advantage can be achieved within and through business ecosystems, leading eventually to profitability and financial success for the participants (Moore, 1998, p. 58).

4.3. Value capture

Many of the frameworks consider value capture to be almost a synonym for capturing money. Dijkman et al. (2015) and Kiel et al. (2017) use the term “revenue flows” – probably due to the fact that they were reviewing cases using the Business Model Canvas framework. At its simplest, value capture answers the question of how the value is monetized (in other words, where the money comes from and where it ends up). The movement of money is also referred to as the “revenue model” (Kiel et al., 2017), “transaction modes” (Zhang and Wen, 2017) and “monetization” (Baden-Fuller and Haefliger, 2013). All these include timing and the effectiveness of fundamental unit pricing. Baden-Fuller also notes that monetization can be leveraged by appropriate complementary assets. While many of the writers have taken a clear monetary perspective, Burmeister et al. (2016) have a wider view of the term. Value capture also
includes the capturing of non-monetary value. Turber and Smiela (2014) approach revenue flows by asking “Why?”, but the same question could also include other values than monetary capture. Like the value proposition, revenue flow, value capture, or whatever one wants to call it, is also the reason behind why someone wants to join an ecosystem or participate in a value chain.

Another aspect of value proposition is that it can also help in identifying customers. Hartmann et al. (2016) prefer the term “customer segment” over “client segment”. For example, questions like “What communication channels should we use to engage our customers?” or “What type of customers do we have – multinational corporations, small or medium-sized companies, or individual consumers?” can help in this identification (Sun et al., 2012). These questions help to define the required tools and activities. Baden-Fuller et al. (2013) emphasize that in addition to identifying the customers and customer groups, it is equally important to understand whether the users are willing to pay for the value proposition or not – and if not, is there another group of customers that would be willing to pay for it? When identified correctly, some customer groups can acquire subsidized goods and services and the whole ecosystem gains value from the network effect (Keskin et al., 2016). As Gassmann et al. (2014) point out: failure to understand who the customers are is a key factor in failing ventures.

5. Discussion and conclusions
We agree with Smedlund et al. (2018) who argue that IoT-enabled business ecosystems are complex and adaptive systems founded on data and connectivity. Therefore, they require diverse strategies. The IoT creates new business model opportunities, but especially, it creates new rules for business, as it requires business models to acknowledge the different business culture in ecosystems. Ecosystems survive when all members find a sufficient reason to participate and contribute.

It can be stated that business ecosystems should be examples of purposeful multidimensional systems that are value-guided and whose participants coexist, interact and form complementary relationships with each other (Gharajedaghi and Jamshid, 2011).
Seven of the 13 identified frameworks emphasize the importance of the ecosystemic approach. However, most of the frameworks for IoT business model creation are based on BMC-type frameworks, which do not describe the linkages or causality in the parts of the system although planning should focus on the ecosystem level. Even the frameworks that do emphasize the ecosystem approach tend to address the phenomena in an overly simplified manner, lacking a clear model or instructions on how to reach the optimal solution. The remaining six frameworks omit the ecosystem aspect, apart from Dijkman et al. (2015), who mention the importance of considering the whole ecosystem in a single sentence in their paper.

Oftentimes, the goal seems to have been to develop models where the pricing offers a low entry barrier and the models are otherwise attractive. In a shared value model, industry- or domain-specific partners usually co-create value. This is used typically in cases where members of the ecosystem can offer some kind of solution development to customers (Chen et al., 2011).

Chan (2015) has created a framework on top of the IoT architecture stack. He proposes that the business model is designed around the “IoT strategy category and value chain”. Table 1 illustrates the structure. Each of the members of the value chain is evaluated separately. For example, in the input column all data input sources are itemized – be it a device or a mobile phone, for example. Likewise, in the benefits column, all monetary and non-monetary values are listed (Chan, 2015).

<table>
<thead>
<tr>
<th>Company</th>
<th>Collaborator</th>
<th>Inputs</th>
<th>Network</th>
<th>Service / processing / packaging</th>
<th>Content / information product</th>
<th>Benefits</th>
<th>Strategy</th>
<th>Tactics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company A</td>
<td>A1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A2</td>
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<td></td>
<td>A3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Company B</td>
<td>B1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B2</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Chan has chosen a structural model where the forms (or even ecosystems) of business procedures need to be described and implemented in an optimal way (Glova et al., 2014). When Chan’s model is compared to the EBM model of Bahari et al. (2015) illustrated in Table 2, it is clear that the two models have prominent similarities. Nonetheless, they answer different questions.
Table 2: Simplified illustration of the EBM model (Bahari et al., 2015, p. 13).

While Chan’s model assumes that benefit is created linearly in one direction, the EBM model acknowledges multi-directional value creation and value capture prospects. On the other hand, the EBM model measures value in money and Chan’s model also recognizes other types of value exchange.

This study has limitations. The decision to choose Google Scholar as the main and sole source of literature has some limitations (see e.g. Haddaway et al., 2015). Secondly, snowball sampling has biases that are hard to assess due to the inherent randomness of the selection. Naturally, the sample used could have been larger; however, based on our search from these databases, the sample is extensive. Thirdly, the analysis process was mainly done by one researcher, thus there may be biases in reading and analysing the data set. Finally, the conceptual blurriness in IoT literature makes it difficult to clearly define the boundaries of the literature and therefore define the boundaries of this contribution. Nevertheless, we hope that this paper adequately describes the details of the research process, thus ensuring future replicability.

However, as this literature review demonstrates, the IoT as such does not necessarily require new frameworks for business model creation. The ecosystemic nature of IoT compels participants to use models other than traditional single company focused models. This is bound to influence the business model development process to become more integrative, interrelational and probably also complex. A single company should
no longer create its business model in a void. It should identify the ecosystem members and co-create an ecosystem-level model, where all members gain more value than the effort they spend in contributing value to others. Interrelating with different parties also facilitates the emergence of an ecosystem. We consider the development of business model frameworks for the ecosystem context to be of the utmost importance and propose that this be covered in future studies. We believe creating these models will require system philosophical thinking to ensure that the model is comprehensive but concise.

Acknowledgements

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References


pp. 29–38. https://doi.org/10.1145/2372251.2372257
Hawaii International Conference on System Sciences. https://doi.org/10.1109/HICSS.2015.176
Keskin, T., Tanrısever, F., Demirkan, H., 2016. Sustainable business models for the
Internet of Things. ORMS-Today.
on business models of established manufacturing companies – A business level
Laudien, S.M., Pesch, R., 2018. Understanding the influence of digitalization on service
https://doi.org/10.1007/s11846-018-0320-1
ecosystems and business models, in Lecture Notes in Computer Science (Including
Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in
Li, H., Xu, Z., 2013. Research on Business Model of Internet of Things Based on MOP,
in International Asia Conference on Industrial Engineering and Management
3-642-38445-5_117
Mejtoft, T., 2011. Internet of things and co-creation of value, in Proceedings - 2011
IEEE International Conferences on Internet of Things and Cyber, Physical and
https://doi.org/10.1109/iThings/CPSCom.2011.75
Minerva, R., Biru, A., Rotondi, D., 2015. Towards a definition of the Internet of Things
(IoT). IEEE Internet Things. https://doi.org/10.5120/19787-1571


## APPENDIX 1 Comparison of business model frameworks

<table>
<thead>
<tr>
<th>Writer(s)</th>
<th>Title</th>
<th>Year</th>
<th>Value proposition</th>
<th>Value Creation</th>
<th>Value Capture</th>
<th>Ecosystem/Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sun, Yun-tu, Bie, Tschannen</td>
<td>A Novel approach to visualizing business models for the internet of things</td>
<td>2012</td>
<td>Value propositions, ER and timely feedback</td>
<td>Needs (What): include channels, customer relationships, customer segments</td>
<td>Value creation (Why): Revenue, cost</td>
<td>SBA model, missing BVA might be reason to slow progress. A-aor inspirations-commercial deals with results and responses to the question of &quot;Why?&quot; The A-box which deals with offer or value consists of three elements: Value Proposition, Revenue and Cost. Kurokawa kutei: BM, mutta yppan testia subete korekon.</td>
</tr>
<tr>
<td>Wadsworth, Lammen, Rajabalan</td>
<td>Designing business models for the internet of things</td>
<td>2018</td>
<td>Value drivers</td>
<td>Value nodes, value exchange</td>
<td>Value extract</td>
<td>Value drivers describe the motivation to join the ecosystem. Value nodes describe the actions and activities (why activities)? Value exchange refers to actions to create and capture value. Value extract shows which of the created values can be monetized. Lareby et al. (2017) on ecosystems (as one IoT ecosystems many-to-one, or &quot;hub and spoke&quot;) A ecosystem business model as a business model composed of value pillars anchored in ecosystems and to cross both the firm's method of creating and capturing value as well as part of the ecosystem's method of creating and capturing value. The eco-system refers to all participants of the ecosystem. Where describes the four layered modular architecture (device, connectivity, services and content). Why describe the reasons to participate for each collaborator. Lot that be monetary or non-monetary. Description 1. &quot;Value&quot; encompasses all participants involved in the ecosystem. This includes partners, suppliers and customers alike, which we refer to as &quot;valued actors&quot; in a wider sense. Related: E. Ilin external ecosystem is &quot;relevant source&quot; (Vesper &amp; Laue, 2007), we therefore suggest to explore all collaborations. Value is co-created by all members of the ecosystem, and not by customers. A differentiation between partners and customers is redundant in this context. Description 2. &quot;Value&quot; encompasses the four layered architecture of targeted submodels 1.11, with each layer as contributive source of value creation and capture entire collaboration partners. Natural: we strongly suggest that these four layers need to be made explicit in our IoT business model as its specific and value networks trace back to this architecture. Dimension 1 &quot;Why&quot; outlines each collaborator's &quot;value&quot; to participate in the ecosystem and mean to outline the benefits of different nature according to (Lue et al., 2010) natural: with the external ecosystem as open resource, we suggest to apply Adner's &quot;value lens&quot; and consider all ecosystem partners surplus of participation and the ecosystem's overall viability. Benefits can be extraneous, yet, through collaborations, non-members (or others come into play). The ecosystem's overall viability is a function of the ecosystem's overall value creation. Based on Osterwalder BM, does not emphasize non-monetary value.</td>
</tr>
<tr>
<td>Turber, Vom Brocke, Gassmann</td>
<td>Designing business models in the era of internet of things</td>
<td>2014</td>
<td>Why</td>
<td>Who, Where</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Turber, Simola</td>
<td>A business model type for the internet of things</td>
<td>2014</td>
<td>Why</td>
<td>Who, What</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Dijkman, Sprekenst, Paaukas</td>
<td>Business models for the internet of things</td>
<td>2015</td>
<td>Value proposition</td>
<td>Key partners, Key resources, Customer relationships, Channels, Customer segments, Cost structure</td>
<td>Revenue streams</td>
<td>No, but mentions it in the discussion</td>
</tr>
<tr>
<td>Ju, Elna</td>
<td>Prototyping business models for all services</td>
<td>2016</td>
<td>Value proposition</td>
<td>Key partners, Key activities</td>
<td>Yes</td>
<td>Based on Osterwalder BM but misses the capture. Value proposition focus on B2BC, comprehensive service business. Value creation includes value chains integration and connected information flows. Value capture appropriates from digital structures and supports price cost individualization. &quot;The value proposition describes the drivers of customer value as well as the unique features of the firm's offering. The value creation layer includes the re-source, capabilities and processes required to deliver the offering - starting from partners' supplier relationships to sales channels. Value capture comprises the underlying cost share / value and revenue formula, which decide on profitability and economic sustainability.&quot;</td>
</tr>
<tr>
<td>Burmeister, Löttgens, Piller</td>
<td>Business Model Innovation for Industry 4.0. Why the &quot;Industrial Internet&quot; Mandates a New Perspective on Innovation</td>
<td>2016</td>
<td>Value proposition</td>
<td>Value creation</td>
<td>Value capture</td>
<td>No</td>
</tr>
<tr>
<td>Author</td>
<td>Title</td>
<td>Year</td>
<td>Value Proposition</td>
<td>Value Creation</td>
<td>Value Capture</td>
<td>Notes</td>
</tr>
<tr>
<td>-----------------</td>
<td>----------------------------------------------------------------------</td>
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<td>----------------</td>
<td>--------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Montanus</td>
<td>Business models for Industry 4.0: Developing a Framework to Determine and Assess Impacts on Business Models in the Dutch Oil and Gas Industry – The IoT-driven business model using blockchain technology for the Internet of Things</td>
<td>2017</td>
<td></td>
<td></td>
<td></td>
<td>No - the IoT business model from entity, commodity and transaction process, in which we study on the 4 stages of the traditional E-business (i.e. they are pre-transaction preparation stage, negotiation stage, Contract signing stage, and Contract fulfillment stage). The IoT business model may involve both monetary and non-monetary value.</td>
</tr>
<tr>
<td>Zhang, Wen</td>
<td>The Influence of the Industrial Internet of Things on Business Models of Established Manufacturing Companies – A Business Model Perspective</td>
<td>2017</td>
<td>Value proposition</td>
<td>Key partners</td>
<td>Revenue streams</td>
<td>No - Based on Osterwalder BIM, does not emphasize non-monetary value.</td>
</tr>
<tr>
<td>Hartmann, Zell, Institut, Wehrhahn</td>
<td>Capturing value from big data – a taxonomy of data-driven business models used by start-up firms</td>
<td>2016</td>
<td>Value proposition</td>
<td>Key resources</td>
<td>Revenue model</td>
<td>No - 6-dimensions, 35 variables and a taxonomy</td>
</tr>
<tr>
<td>Beuaman, De Vos, Haaker</td>
<td>Mobile service innovation and business models</td>
<td>2018</td>
<td>Value proposition</td>
<td>Organization domain, technology domain</td>
<td>Finance domain</td>
<td>No - STDF model</td>
</tr>
<tr>
<td>Chan</td>
<td>Internet of Things Business Models</td>
<td>2015</td>
<td>Benefits</td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
</tbody>
</table>
### APPENDIX 2  Comparison of business models

<table>
<thead>
<tr>
<th>Definition</th>
<th>Emphasis</th>
<th>Scope</th>
<th>Authors &amp; Year</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>An architecture for the product, service and information flows, including a</td>
<td>value proposition, value</td>
<td>Network-centric /</td>
<td>Timmers, 1998</td>
<td>Business Models for Electronic Markets</td>
</tr>
<tr>
<td>description of the various business actors and their roles and a description of the potential benefits for the various business actors and a description of the sources of revenues.</td>
<td>capture</td>
<td>ecosystemic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A business model depicts the content, structure and governance of transactions</td>
<td>value creation</td>
<td>Company-centric</td>
<td>Amit &amp; Zott, 2001, p.511</td>
<td>Value creation in e-business</td>
</tr>
<tr>
<td>designed so as to create value through the exploitation of business opportunities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The method by which a firm builds and uses its resources to offer its customers</td>
<td>value proposition, value</td>
<td>Company-centric</td>
<td>Ahuay &amp; Tucci, 2001, p.3</td>
<td>Internet business Models and Strategies</td>
</tr>
<tr>
<td>better value than its competitors and to make money doing so. It details how a firm makes money now and how it plans to do so in the long term. The model is what enables a firm to have a sustainable competitive advantage, to perform better than its rivals in the long term. A business model can be conceptualised as a system that is made up of components, linkages between the components, and dynamics.</td>
<td>capture</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A description of the roles and relationships among a firm’s consumers, customers,</td>
<td>value creation, value</td>
<td>Value network /</td>
<td>Well &amp; Vital, 2001, p.34</td>
<td>Place to Space: Migrating to e-business Models</td>
</tr>
<tr>
<td>allies and suppliers that identifies the major flows of product, information, and money, and the major benefits to participants</td>
<td>capture</td>
<td>ecosystemic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A construct that mediates the value creation process. It translates between the technical and the social domains, selecting and filtering technologies, packaging them into particular configurations to be offered to the market</td>
<td>value creation, value</td>
<td>Company-centric but includes value network</td>
<td>Chesbrough &amp;</td>
<td>The role of the business model in capturing value from innovation – evidence from Xerox Corporation’s technology spin-off companies</td>
</tr>
<tr>
<td>proposition/act of innovation, architecture of revenue</td>
<td>capture</td>
<td>positioning</td>
<td>Resonblom, 2002</td>
<td></td>
</tr>
<tr>
<td>A good business model answers Peter Drucker’s age-old questions: Who is the customer? And what does the customer value? It also answers the fundamental questions every manager must ask: How do we make money in this business? What is the underlying economic logic that explains how we can deliver value to customers at an affordable cost? Includes all the activities associated with making and selling something</td>
<td>iterative, value proposition, value capture, value delivery</td>
<td>company-centric</td>
<td>Magretta, 2002, p.4</td>
<td>Why Business Models Matter</td>
</tr>
<tr>
<td>A business model elucidates how an organization is linked to external stakeholders, and how it engages in economic exchanges with them to create value for all exchange partners</td>
<td>value creation and value exchange</td>
<td>company-centric</td>
<td>Zott &amp; Amit, 2007, p.181</td>
<td>Business Model Design and the Performance of Entrepreneurial Firms</td>
</tr>
<tr>
<td>The business model is like a blueprint for a strategy to be implemented through organizational structures, processes and systems</td>
<td>strategy implementation</td>
<td>Value network acknowledged but company-centric</td>
<td>Osterwalder &amp; Pigneur, 2010, p.15</td>
<td>Business model generation: a handbook for visionaries, game changers, and challengers</td>
</tr>
<tr>
<td>A business model articulates the logic, the data, and other evidence that support a value proposition for the customer, and a viable structure of revenues and costs for the enterprise delivering that value</td>
<td>value proposition, Company-centric value capture</td>
<td></td>
<td>Tece, 2010, p. 179</td>
<td>Business Models, Business Strategy and Innovation</td>
</tr>
<tr>
<td>Business Model refers to the logic of the firm, the way it operates and how it creates value for its stakeholders. Strategy refers to the choice of business model through which the firm will compete in the marketplace</td>
<td>value creation, value capture</td>
<td>company-centric</td>
<td>Cascadden-Macawell &amp; Ricart, 2010, p.156</td>
<td>From strategy to business models and onto tactics</td>
</tr>
<tr>
<td>Articulates the value proposition, identifies a market segment and specify the revenue generation mechanism, defines the structure of the value chain required to create and distribute the offering and complementary assets needed to support position in the chain, details the revenue mechanism(s) by which the firm will be paid for the offering, estimates the cost structure and profit potential, describes the position of the firm within the value network linking suppliers and customers, formulates the competitive strategy by which the innovating firm will gain and hold advantage over rivals</td>
<td>value proposition, Supply chain</td>
<td>acknowledged but company-centric</td>
<td>Chesbrough, 2010, p. 355</td>
<td>Business model innovation: Opportunities and barriers</td>
</tr>
<tr>
<td>An abstraction of the complexity of a company by reducing it to its core elements and their interactions</td>
<td>Value network / ecosystemic</td>
<td></td>
<td>Bucher &amp; Luckmann, 2011, p. 256</td>
<td>Business Models for the Internet of Things</td>
</tr>
<tr>
<td>A business model defines who your customers are, what you are selling, how you produce your offering, and why your business is profitable</td>
<td>value proposition</td>
<td>Company-centric</td>
<td>Gassman et al, 2014, p.7</td>
<td>The Business Model Navigator: That Will Revolutionize Your Business</td>
</tr>
</tbody>
</table>


Effects of Innovative Patterns of Smartphones on Brand Switching

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Arden University, United Kingdom

Wilson Ozuem
University of Cumbria, United Kingdom

Abstract

Undoubtedly, recent technological advancement in smartphones has completely altered how information is accessed, shared, and created. Consumer purchase intentions and choice has recently been influenced by the emergence of disruptive innovation in smartphones. Recent advancement in technology has caused a major shift in the use of smartphones from its conventional purpose of communication to include additional features that have created a greater market and altered the purchase behaviour of the consumers. In this modern era of technological advancement, users of smartphones expect other advanced features such as media support, Internet connectivity and special applications. The current paper discusses significant effects of innovative patterns of smartphones on consumers purchase intentions and brand switching. To conclude, the paper provides relevant practical and managerial implications for the development of marketing strategies.

Keywords: Smartphone, Brand Switching, Brand Loyalty, Consumer Behaviour.

Introduction and Background

The evolution of the Smartphone has impacted significantly on consumer behaviour and choice. Mobile phone technology was initially used only for communication purposes but has recently advanced to include additional features that have created a greater market and altered the purchase behaviour of the consumers (Slawsby et al., 2003; Dwivedi, 2015; Appiah & Ozuem, 2018). This has brought about significant increase in the number of Smartphone users. The Smartphone continues to have a significant shift from the traditional use for communication to a device with various applications. Users of smartphones, however expect rather advance features such as media support, internet connectivity and special applications (Jones, 2002; Hansen, 2003 and Norazah, 2013). Hence Smartphones are considered radically innovative products due to their additional features which are similar to miniature computers (Appiah, Ozuem & Howell, 2019).

The intense growth in the usage of Smartphones have created greater perception and expectations (Edell & Burke, 1987; Aaker, 1997; Dickinson, Ghali, Cherriet, Speed, Davis & Norgate, 2014; Wang et al., 2012). Innovations in hardware and software have triggered enormous growth in the Smartphone market, since the multi-functional operations in these devices generate the trust in technology that consumers expect. Trust in Smartphone devices and their features ultimately adds brand recognition and this is the primary factor that affects intentions to purchase (Nah et al., 2003).
**Aims and Significance**

Market disruptions are the major cause of brand switching. Market disruptions are major events occurring in a market that threaten customer–brand relationships (Fournier, 1998; Appiah, Ozuem & Howell, 2016). This paper investigates the phenomenon of the brand switching behaviour of consumers in a competitive market, namely the Smartphones industry, with implications of its innovative patterns on brand switching.

The bulk of research on brand switching covers customers’ intentions to assess possible substitutes of a particular product category to maximise the functional utility of product attributes (Seiders and Tigerts, 1997). With expectations of product function, insufficient attention has been paid to the socio-psychological attributes and social meanings of brands triggered by disruptive innovations (Rao et al., 2000; Appiah et al., 2019).

Drawing from the above, this paper explores existing literature on band loyalty to examine the effects of innovative patterns in the smartphones on customer loyalty. Despite extensive studies on brand loyalty (Ozuem and Lancaster, 2012; Zeithaml, 1998; Ozuem, Thomas, & Lancaster, 2016), minimal research have been carried out to establish how market disruptions impact negatively customer-brand relationships and strategies companies may adopt to gain competitive advantage by repositioning themselves to sustain brand loyalty when disruptions occur in today’s complex and globalised business environment (Lam et al., 2010).

Secondly, this paper focuses on Smartphones as the product category because it represents a context in which brand switching is most likely to occur because of the multiple alternatives and short inter-purchase frequencies (Hung and Ho, 2017). Notably, the market for Smartphones is probably the most dynamic in terms of innovation and the rate of change in the technology and product innovation disrupting the market is staggering (Azize et al., 2013; Cecere et al., 2015).

Finally, the paper could also benefit organisations from a managerial point of view, especially brand and customer relationship managers who must devise customer relationship strategies to achieve a sustainable competitive advantage (Da Silveira, et al., 2013; Stokburger-Sauer et al., 2012).

**Theoretical Framework and Contextualisation**

Switching occurs when a customer is motivated to review available alternatives in a marketplace due to a change in competitive activity in the marketplace (Seiders & Tigert, 1997; Appiah, Ozuem & Howell, 2017). Similarly, Hogan and Armstrong (2001) posited that brand switching is about replacing an incumbent resource with a more valuable one to achieve competitive advantage. Sathish, Kumar, Naveen and Jeevanantham (2011) indicated that brand switching is a consumer behaviour that sees the behaviour of consumers differ based on the satisfaction level of consumers with providers or companies. Hence brand switching can be defined as the process of being loyal to one product or service, and switching to another, due to dissatisfaction or any other problems. They further argue that even if a consumer is loyal to a particular brand, if the brand does not satisfy his/her needs the consumer may switch to a competing brand. Therefore, management needs to constantly evaluate and redirect its resources and capabilities in order to maintain a strong position relative to competitors (Itami & Roehl, 1987).
Consumer loyalty is defined as the degree to which a consumer exhibits repeat purchasing behaviour from a service provider, possesses a positive attitudinal disposition toward the provider, and considers using only this provider when a need for this service arises (Gremler & Brown, 1996; O’Keeffe, Ozuem, Lancaster, 2016; Ozuem, Thomas & Lancaster, 2016). Losing a consumer is a serious setback for a firm in terms of its present and future earnings. In addition to losing the benefits discussed above, the firm needs to invest resources in attracting new consumers to replace the ones it has lost and this incurs expenditure on advertising, promotions and initial discounts. Peters (1987) shows that it can cost five times more to acquire a new consumer than to retain an old one. Consequently, retaining an established current consumer base is much more attractive and viable than searching for new consumers.

Product characteristics are likely to affect exploratory tendencies such as brand switching proponents (BSPs) and innovation in product contexts with a large number of available alternatives and a short inter-purchase frequency (Hoyer & Ridgway, 1984). These characteristics include product involvement, perceived risk, brand loyalty, perceived brand differentiation/similarity, hedonism (or pleasure) and strength of preference (Hoyer & Ridgway, 1984; Van Trijp, Hoyer & Inman, 1996). When individuals are highly involved with a product and loyal to a brand, their propensity to switch is likely to be lower (Hoyer & Ridgway, 1984; Sloot, Verhoef & Franses, 2005).

Individuals who are involved with a product have ‘a narrow latitude acceptance’ (Sherif & Sherif, 1967); thus, they are unlikely to be persuaded to switch. Similarly, according to Sloot et al. (2005), loyal consumers are less likely to switch to another brand. Persuasion to switch may be manifested in the form of sales promotions such as offers and discounts, which have been found to encourage switching across various product contexts (Kahn & Louie, 1990).

Further, high perceived risk indicates that individuals are concerned with losses resulting from their purchases (Mitchell, 1999). High perceived risk leads to avoidance tendencies and behaviours (e.g. commitment to a brand, repeat purchase behaviour) as consumers are ‘more often motivated to avoid mistakes than to maximise utility in purchasing’ (Mitchell, 1999, p. 163). Further, perceived similarity between brands within a product class indicates that individuals are likely to exhibit switching tendencies, such as alternating among familiar brands within a product class (Hoyer & Ridgway, 1984).

Hedonism may also encourage switching within specific categories of products (Hoyer & Ridgway, 1984; Van Trijp et al., 1996). Hedonism is associated with enjoyment or pleasure that an individual derives from specific products (Griffin, Babin & Modianos, 2000). Consumers are more intrinsically motivated with products that are associated with affective (hedonic) sensations (Hirschman & Holbrook, 1982); thus the repeated consumption of such products is likely to elicit switching tendencies (Van Trijp et al., 1996).

Market disruptions are the major cause of brand switching. Market disruptions are major events occurring in a market that threaten customer–brand relationships (Fournier, 1998; Stern, Thompson & Arnould, 1998; Appiah, Ozuem & Howell, 2016). Disruption is defined as a situation where markets cease to function in a regular manner, typically characterised by rapid and large market declines. For instance, disruptions in the financial markets are caused by a glut of sellers willing to trade at any price, combined with the near or total absence of buyers at a particular time. In these circumstances, prices can decline precipitously (Shapiro, 2010).
The theory of disruptive innovation introduced by Christensen (1997) offers an explanation for the displacement of industry by smaller competitors, which are almost always new entrants (Bower & Christensen, 1995; Christensen, 2013). Disruptive innovation is an innovation that helps create a new market and eventually goes on to disrupt an existing market (Ozuem, Howell & Lancaster, 2008). The term is used in business and technology literature to describe innovations that improve products or services in ways that markets do not expect; first by designing for a different set of consumers in the new market, and later by lowering prices in the existing market.

According to McGrath (2011), the theory’s explanatory power comes from the notion that industry incumbents and new entrants follow different technology trajectories. Industry leaders tend to focus on sustaining innovations that continuously improve their flagship products and increase their overall performance in attributes that are perceived as being important for their existing customer base. Over time, the performance increase achieved through sustaining innovations begins to overshoot the needs of the best customers who pay the most, whereas the new entrants’ disruptive products become good enough to meet the needs of the dominant.

Conclusions and Managerial Implications

Managerially, this paper provides pointers for brand and customer relationship managers in terms of how to devise customer relationship strategies to achieve a sustainable competitive advantage.

First managerial implication based on findings from this study indicates that innovative brands such as Apple and Samsung are susceptible to disruption at their initial stages. This drives huge interest that may interrupt consumer–brand relationships, yet with time this interest may become fragile. Based on this finding, this paper proposes that brand managers must allocate investment to build stronger consumer-brand relationship at the maturity stage of a product life cycle to resist switching during disruptions. Managers must invest in marketing activities that improves consumers' perceived quality and self–brand congruity to extend the maturity stage of a brand. This will help provide resistance to switching over time.

Also, consumers form strong relationships with those brands which they perceive to have values and personality associations that are congruent with their self-concept (Da Silveira et al., 2013; Stokburger-Sauer et al., 2012; Lam et al., 2013). This forms key consideration for brand managers in brand positioning as consumers appear to use brand associations to assess congruence between their ‘selves’ and the brand. For instance, renowned brands like Samsung and Apple relate their brand identities to consumers' identities (Arnould and Thompson, 2005; Grayson and Martinec, 2004). Therefore, marketers must aim to create strong consumer–brand relationships with brands by developing a brand that matches with their identified lifestyle (Badrinarayanan and Laverie, 2011; He et al., 2012; Yeh et al., 2016).

Finally, this paper suggests that while non-innovative consumers are less likely to identify with a specific brand of Smartphone, brand managers can develop consumer-brand relationship among such consumers by concentrating on key drivers such as perceived quality and innovation. Brand managers need to have awareness of the fact that even though the perceived quality of established brands may not seem to influence consumers at the initially, innovation contribute to the dissipation over a long period of time.
REFERENCES


UNDERSTANDING PERCEIVED VALUE OF MOBILE PAYMENTS: A QUALITATIVE STUDY

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Abstract

Mobile payment (MP) applications have long been deemed as a disrupting innovation within the payments landscape given the massive take up of smartphones worldwide. However, realizing such potential can only be achieved through a deep understanding of how consumers perceive value in such innovation. This study employed the perceived value theory to provide an in-depth interpretation of the different determinants of MP value as perceived by current and prospective consumers. A total of 23 interviews have been conducted with both adopters and nonadopters. The findings suggest that the convenience value of MP represents the major value-adding factor for adopters whereas the use of existing contactless card-based payment method represented the main benchmark with which nonadopters negatively valued contactless mobile-based payment methods. These findings provide a profound understanding of the perceived value theory within the context of MP and offer suggestions to MP applications providers.

Keywords: Proximity mobile payment, perceived value theory, technology adoption

1.0 Introduction

Smartphones appear to have achieved a massive success in terms of penetration rate among consumers worldwide. Earlier forecasts anticipated that mobile payments will be among the highly adopted mobile applications due to convenience advantages they bring to users as a result of the ubiquity of the mobile phone (Anckar and D’incau, 2002). Mobile payment (MP) is defined as “any payment where a mobile device is used to initiate, authorize and confirm an exchange of financial value in return for goods and services” (Au and Kauffman, 2008). The payment as a process is broadly
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classified into two main types, remote and proximity MP (Ondrus, 2015). The most common form of proximity MP is conducted through wallet apps by tapping the smartphone over a payment terminal. The terminal activates a Near Field Communication (NFC) session prompting the communication of card payment information stored in the smartphone’s secure chip. Remote MP takes the form of an online transaction that use pre-stored or manually-entered payment information through mobile apps or mobile-based web browsers for checkout. Findings from academic and market research studies have consistently indicated that the uptake of MP is far below earlier projections. Although the adoption rate gap between mobile devices and their MP applications among consumers had been reported by studies dating back to a decade ago (e.g. Chen, 2008; Mallat, 2007), the same phenomenon has been addressed by more recent studies (Slade et al., 2015; Johnson et al., 2018). MP adoption in the UK does not seem to be an exception, where forecasts suggest that mass adoption of proximity MP will be less likely realized in the foreseen future (eMarketer, 2018). Given the rich landscape of commercially available proximity MP solutions in the UK, mainly including mobile wallet apps provided by global players such as Apple Pay, Google Pay and Samsung Pay (Gibbs, 2017), it could be argued that there is a need for a further understanding of the factors affecting consumers’ decisions to take advantage of this market variety.

Commercial mobile wallet apps are marketed as a convenient and secure payment instrument that features a seamless user experience and enhanced security measures (Apple, 2018; Google, 2018). However, contrary to other emerging technology innovations that tackle previously unresolved issues, proximity MP is arguably a new form of payment that competes with existing widely used payment instruments mainly including cards and cash (Slade et al., 2015). Such instruments have not only gained consumer’s trust over time, but also introduced new convenient ways of conducting payments as in the case of contactless cards. Many previous studies attribute the low penetration of MP solutions to consumers’ perceptions of seeing little or no value over existing traditional payment methods (Ondrus, Lyytinen and Pigneur, 2009; Pham and Ho, 2015). Indeed, theories from consumer behaviour literature postulate that the consumer’s eventual choice behaviour is determined by the perceived value of a given product in comparison with other alternatives (Sheth, Newman and Gross, 1991). The richness of the concept of value as a highly subjective construct (Woodruff, 1997) suggests the need for a deeper understanding of MP value through eliciting insights.
directly from consumers. Although recent MP adoption studies have offered some valuable insights about consumers’ perceptions of value in MP, such studies were predominantly self-reported and quantitative in nature. This study attempts to fill this methodological gap by qualitatively investigating the perceived MP value dimensions and answering two central research questions: 1- What are the main determinants of value and their meaning as perceived by existing and prospective proximity MP consumers? 2- How these different determinants are interrelated? This paper is organized as follows. Section 2 introduces the theoretical foundation of the study. In Section 3, the methodology used for investigation is described followed by a presentation of the findings in Section 4. The study concludes in Section 5 with a detailed discussion of the findings along with their theoretical and practical implications and provide future research suggestions.

2.0 Theoretical foundation

Technology adoption researchers have successfully employed the perceived value theory as a basis to explain adoption of different technologies. The basic assumption of this value-based approach suggests that value maximization is the common determinant of the consumer eventual behaviour (Kim, Chan and Gupta, 2007). Although the concept of perceived value from a consumer’s perspective has been defined by many marketing researchers, Eggert and Ulaga (2002) identified three common definition elements. First, perceived value is a trade-off between a combination of multiple components of benefits and sacrifices as perceived by consumers in a market offering (Zeithaml, 1988). Second, value is recognized as a subjective construct where different consumers perceive different values in a given product. Finally, value is relatively perceived in comparison with available alternative market offerings in a specific use situation. The subjective nature of the concept of perceived value appears to be reflected in how researchers recognized its determinants. Whilst some researchers conceptualized value as a trade-off between quality and price (e.g. Dodds and Monroe, 1985), others suggested that value is a more complicated concept that needs to address other experiential dimensions beyond pure utilitarian goals (Holbrook and Hirschman, 1982; Sweeney and Soutar, 2001). Based on the theory of consumption values (Sheth, Newman and Gross, 1991), Sweeney and Soutar (2001) developed a generic framework that represents value as a combination of functional, emotional and social values. Although this theory is
recognised as a comprehensive representation of the different forms of value validated across a variety of disciplines (Sweeney and Soutar, 2001), it is argued that it failed to consider the costs involved in consumption (Kim, Chan and Gupta, 2007). A limited number of recent contributions have started to utilize the perceived value theory as a means to understand consumer’s adoption of MP. Cocosila and Trabelsi (2016) have investigated the adoption of proximity MP through an integrated value-risk model, where determinants of value included utilitarian, enjoyment and social values as benefits while the sacrifices side incorporated multiple facets of risk. Similarly, de Kerviler et al. (2016) have studied the adoption of in-store MP and information search. However, they dichotomized utilitarian benefits into convenience and economic benefits, hedonic benefits into enjoyment and experiential benefits along with the social benefits, in addition to privacy and financial risks as sacrifices. Both studies have empirically confirmed the significance of the positive effect of utilitarian, hedonic and social benefits as well as the negative effect of perceived risk on the eventual behaviour. Nevertheless, interrelationships between determinants of value were not validated by both studies. Following the same line of research, this study employs the perceived value theory as a point of departure to explore value of MP in terms of benefits and sacrifices. In doing so, we build on previous research and derive the determinants of the benefits side of value to include convenience, monetary, social and enjoyment (Sweeney and Soutar, 2001; Pura, 2005) in addition to perceived trust in provider (Kim, Xu and Gupta, 2012). For the sacrifices side, we include perceived risk in accordance with Sweeney, Soutar and Johnson (1999). The following subsections draw on previous studies to define and support the inclusion of these determinants within MP context.

2.1 Convenience value
Functional value was conceptualized as two separate components representing utilities derived from performance-related attributes and monetary value perceived in a product or service compared to alternatives (Sweeney and Soutar, 2001). Pura (2005) argues that the performance aspect of functional value is derived from the convenience of fulfilling a task. Convenience is one of the main value-adding features offered by mobile commerce applications (Anckar and D’inceau, 2002). Service convenience comprises four dimensions, namely time, place, acquisition and use (Brown, 1990). While time and place convenience involve the elimination of temporal and spatial limitations of service access, acquisition and use convenience are related
to how acquiring and using the service is effortless. In particular, the ubiquity of MP has been considered as the main advantage offered over other online and offline payment methods (Zhou, 2013). Following this perspective, this study defines convenience value as the consumers’ perceived utility from the ease of registration and use of MP as a service accessible anytime and anywhere.

2.2 Monetary value

Monetary value is the other component of functional value referring to the value a consumer receives for money paid at an acceptable price level (Sweeney and Soutar, 2001; Pura, 2005). Pihlström and Brush (2008) suggest that all mobile services save time and money, therefore a monetary value could be attached to their use. This assumption is supported by de Kerviler, Demoulin and Zidda (2016), where they found a positive relationship between the economic benefits of money saving and using a smartphone for information search and payment for shopping. Drawing on this argument, this study defines monetary value as the consumer’s perceived utility of the money savings resulting from using MP apps compared to other payment methods.

2.3 Enjoyment value

Also termed as emotional or hedonic value, enjoyment value refers to the utility acquired by consumers from the capability of a product or service to trigger feelings or affective states (Sheth, Newman and Gross, 1991). As an important determinant of technology acceptance and use, Venkatesh et al. (2012) defined hedonic motivation as the “fun or pleasure derived from using a technology”. Researchers have suggested that consumer motivations to adopt technologies are not only driven by the utilitarian values, i.e. convenience and monetary, but also consider technologies as sources of enjoyment. Previous studies found a significant positive relationship between enjoyment perception and the perceived value of MP (Koenig-Lewis et al., 2015; Cocosila and Trabelsi, 2016). Consistent with these conceptualizations, this study defines enjoyment value as the positive feelings that consumers derive from interacting with their MP app when conducting a payment transaction.

2.4 Social value

Social value is defined as the product or service ability to enhance social self-image and interpersonal communication (Sheth, Newman and Gross, 1991; Sweeney and Soutar, 2001). The social aspect here addresses how appreciation from important others with regards to the use of a given service is perceived by the concerned individual. Within this context, social value was found to significantly affect the
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customer’s intention to use mobile apps (Wang, Liao and Yang, 2013). Similarly, perceived value of proximity MP was found to be positively affected by social value (Cocosila and Trabelsi, 2016). Therefore, this study recognizes social value as a source of self-appreciation perceived from the impression conveyed by peers in a social context with regards to the use of MP.

2.5 Trust in provider
Trust entails the willingness to be vulnerable to the actions of another party based on positive expectations toward the future behaviour of that party (Mayer, Davis and Schoorman, 1995; Zhou, 2013). Trust is a central notion in distant commercial relationships lacking direct personal communication where perceptions of uncertainty become dominant (D Harrison McKnight, 2001). This is particularly applicable to online financial services where the risk of potential monetary loss resulting from information misuse becomes a major concern. Perceived trust in online vendors was found to positively influence the perceived value of online shopping on the basis that trust reduces the nonmonetary cost of risk (Kim, Xu and Gupta, 2012). Although value-based MP adoption studies have largely ignored the effect of perceived trust on perceived value, this study anticipates that the perceived trustworthiness of a MP provider will have an impact on the perceived value of MP as a financial service conducted over smartphones.

2.6 Perceived risk
Perceived risk is defined as “the consumer’s subjective belief of suffering a loss in pursuit of a desired outcome” (Pavlou, 2003). Perceived risk has received a great deal of attention by MP adoption researchers. Whilst some researchers verified a direct negative effect of perceived risk on adoption intention (e.g. Chen, 2008; de Kerviler et al., 2016), others included perceived risk as a nonmonetary cost into their perceived value model (e.g. Cocosila and Trabelsi, 2016). Therefore, this study defines perceived risk as the consumer’s belief of uncertainty regarding the security of their information and the reliability of using a mobile device when paying for goods or services.

3.0 Methodology
3.1 Data collection
A qualitative approach using semi-structured interviews was employed due to the exploratory nature of this study (Creswell, 2007), where extant literature offered very
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little understanding about the exact meaning of the determinants of value within MP context. Snowball sampling technique was utilized by asking participants invited through university research groups and social contacts to share the invitation with other potential participants. The selection criteria were set to include participants who have used a smartphone and are residents of the United Kingdom. No restriction was made on previous MP experience so that both adopters and nonadopters are included.

3.2 Interviews
Interviews were conducted between November 2017 and April 2018. The interview guide was first piloted with two PhD students. Their comments were taken into consideration to rephrase and elaborate on questions that were not fully understood. Invited participants were first briefed about the aim of the study and were asked general demographic questions. Each determinant of the perceived value was then defined to participants followed by questions about their own perceptions about the presented determinant. This method allowed participants to define each component in their own words and contextualize their answers around the use scenarios of MP from a perspective of value, i.e. whether they would perceive the given determinant as value-adding or value-inhibiting to the payment experience. Generally, the nature of the questions was designed to be open-ended to allow a room for participants to elaborate on their answers. Probing questions were used to provide further insights for other factors that might have not been anticipated in the beginning.

3.3 Sampling and coding
Interview recordings were transcribed and content-analysed using Nvivo 11 software. Data analysis involved labelling segments of the transcripts with codes that were then categorized under a main theme. An initial set of themes was developed based on the theorized determinants of value. Codes that could not fit under an existing theme were categorized under a new theme. Coding took place in parallel with data collection, allowing the interview guide to evolve as further themes emerge. The sampling continued until a data saturation point has been reached where no new codes could be identified. A total of 23 participants were interviewed, Table 1 provides a summary of the characteristics of the participants.

4.0 Findings
Given the unconditional sample selection with regards to prior proximity MP experience, the interviews involved both adopters and nonadopters. Less than a third
of participants (30%) have ever used their phone as a proximity payment method. All of them have used native wallet apps provided by mobile device manufacturers such as Apple Pay and Android Pay to make payments.

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Table 1. Demographics of the participants

4.1 Convenience value

Convenience of proximity MP was mainly identified by the participants in terms of the ubiquity of the mobile phone. Ubiquity meant that they carry their phones all the time with a multitude of applications that they use on the move. The fact that mobile payment applications coexist with other frequently used applications on the same device was perceived among adopters as a convenient alternative payment method that saves them the cognitive effort of minding their wallets. They also mentioned that making a payment through a mobile app saves them the effort of getting cards or cash out of a physical wallet. In addition, some adopters considered using proximity MP for small amount purchases as another convenience factor. Their reasoning could be attributed to two aspects, saving the time of handling coins and exerting less cognitive effort to quickly pay for small amounts.

"... I am in a rush, I don’t have to worry about carrying something else on me, so it’s already there in my phone and I always have my phone... because everything I need is on my phone" (P1)

"using contactless Apple Pay is very convenient especially in the café or for buying something really small from a grocery shop. I use it especially when the value of the purchase is very small below 10 pounds I tend just to use my mobile straightaway” (P2)

Although some of the nonadopters acknowledged the convenience of MP in terms of the ubiquity of the phone, however they added that proximity MP offer little or no convenience value over the contactless card. Many nonadopters perceived MP apps as less convenient and more time consuming than the contactless card based on
perceptions of complexity involved in MP mainly including the need to find and launch an app.

“I haven’t investigated thoroughly how it would work I mean my worries that to use it I’d have to first get into login to the phone and then I’d have to start an app you know by the time I’ve done this I’d have wasted time while the card seems to work without requiring a PIN code most of the time...so there’s not a great push factor I guess to use the phone” (P16)

4.2 Monetary value

Almost all participants stated they see no financial value in return for using proximity MP. Adopters went further to say that using proximity MP has caused them to overspend due to the ease of access to payments compared to using cash. In addition, the intangibility of the amount of money spent using proximity payments appear to have increased their expenditure compared to handing in actual cash.

“I buy a coffee or this sort of thing, just with one click, I find it easy comparing with cash because if I don’t have cash sometimes I would rather not to buy a coffee...” (P8)

Likewise, nonadopters did not perceive any potential savings from using proximity MP. They elaborated on this by explaining that they would spend the same amount regardless of the payment method.

“...it all comes from the same place so probably I see it’s kind of the same thing however where I am paying for it, it is still coming out of my account” (P5)

In terms of monetary cost, most participants saw no extra cost associated with using MP similar to the case of other payment methods in terms of transaction cost. Moreover, other elements of cost such as network charges and mobile phone cost were not mentioned.

“The charges that you will incur normally for a phone payment are going to be incurred for any sort of online or mobile payment. So I don’t think there’s any additional costs” (P12)

4.3 Enjoyment value

In general, the findings suggest that the enjoyment value is closely associated with the degree of the perceived convenience of proximity MP apps rather than being a strong value proposition on its own. In addition, the app design aesthetics was considered by some adopters as a factor that could possibly lead to some affective states. Adopters
expressed their enjoyment of using proximity MP in terms of how easy and fast it is to complete the payment as well as the app sound notification received when the payment is successful.

“"Weirdly, when I moved from iPhone to Samsung, and because Samsung is just a lot easier, I now get a little bit of joy in comparison … and I will get that very satisfying buzz” (P7)

Similarly, nonadopters mainly derived their perception of enjoyment from convenience-related facets including ease of use and quick access.

“"That would depend very much on how easy it is to use the app, if it is not very intuitive or it’s got a bad layout that would be quite frustrating and annoying” (P15)

4.4 Social value

The findings indicate that the perception of social value is associated with the self-social image attained among close social groups. Participants perceived the social image as the impressions that their peers would have for them as being up-to-date with new technologies that serve a good purpose. They also perceived that using proximity MP will enhance their social interaction within their peer social groups with MP experience.

“"...it would make me look like everyone else in a way that I was accepting that things are safe and that I was using technology in a purposeful way” (P4)

“I was talking to friends ... and a few of them do use mobile payments and I had to say I hadn’t used it before so I suppose if I did use it I would be similar to them” (P15)

However, some participants noted that they do not see a significant social value attached to using MP in general because they think it’s irrelevant to their old age group. Others went further to associate a negative social aspect as they anticipate that using proximity MP might be perceived as a kind of showing off.

“"Although if I was younger I might, me five years ago I would probably care a bit more” (P7)

“"...they might see it as showing off, I am not convinced that it’s necessarily wholly positive” (P6)

4.5 Perceived trust

Participants perceived trust in proximity MP service providers through three main dimensions: the provider’s business size, whether they are a regulated entity, and their
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reputation. A clear majority of participants considered the size of the provider as an important aspect of trustworthiness. The size was mentioned within the context of how popular the providers’ products are, thus giving an indication about the level of trustworthiness in terms of how many people are already trusting their products.

“…if it [the company] is big then lots of people use it and because lots of people use it that generates a sense of confidence” (P21)

“When I saw like Apple, my first reaction was hang on, this is not their specialty. So initially there was a bit of mistrust there but now everyone seems to be using them I am kind of realizing they are going to be OK” (P5)

The findings further suggest that financial services providers are considered trustworthy because they are strictly regulated by a central regulatory body. Although the most popular MP apps are provided by technology companies, however most participants were more inclined to trust well-established financial institutions such as banks and card schemes. In addition, some participants considered the newly emerging online-based challenger banks as trustworthy because they are regulated.

“… they’re safe because it is a regulated market so no service could offer this without being regulated and to be regulated certain standards have to be upheld…” (P3)

“I think when I learned about Monzo, this mobile bank, first thing I looked at FCA (Financial Conduct Authority) and they seem to be approved by the FCA and that encouraged me” (P17)

Reputation of the provider was mentioned by some participants as another aspect of trust. They perceived reputation in terms of whether a provider has encountered data breaches or security issues in the past.

“has there been any big news reports about massive data breaches in that company… if you were to hear that kind of thing that would very much put me off” (P19)

Most participants confirmed that trust in the provider of mobile payments reduces their perception of risks associated with MP. In particular, adopters have associated the security features of their MP wallet app with trust in provider.

4.6 Perceived risk

Although some adopters have mentioned that they are aware of the potential risks involved in using proximity MP, the findings indicate that perceptions of risk were higher among nonadopters. Whilst adopters described the potential risks as being
avoidable or less likely to stop them from continuing to use proximity MP, nonadopters seem to perceive these risks as a major barrier. Participants identified risks under three main categories as follows.

**Identity and payment information theft** was mentioned by many participants as a consequence of different incidents, including loss or theft of the phone, hacking into the phone either directly or through wireless networks, or as a result of a mass security breach targeting the provider’s system. Surprisingly, mobile phone loss was the most mentioned potential risk among participants despite their awareness of the security measures equipped with their phones compared to contactless cards. Moreover, many participants were particularly influenced by the news of mass cyber-attacks that some well-known service providers have encountered in recent years.

“My main risks would be if your phone got stolen people can potentially, especially if you haven’t got a password on your phone which in this day and age is naïve, but people can then very easily make payments” (P12)

“we have seen recently significant data breaches in various forms...apple is a big company, google is a big company that makes them big targets” (P19)

**Privacy concerns** were considered by some participants as another risk pertaining to the way MP service providers would deal with stored payment information. Participants seemed to be highly influenced by the increasing media reports of data misuse by some technology service providers and the fear of unauthorized sharing of their sensitive information with third parties.

“I am a little bit cautious at the moment and of course the other thing now...is all of the information that is coming out about our data through Facebook, so in general my sense of trust in these providers has just dived” (P21)

**Reliability of the mobile phone** was mentioned by some participants in terms of the limitation of the phone battery life. They associated the risk of being unable to access their money with potential battery outage.

“my phone runs out of power this happens a lot...If my phone runs out of power, which is likely to do, I have no money” (P10)

### 4.7 Existing alternatives

In addition to the factors that were initially included in this study, existing alternative payment methods posited itself as a strong value-inhibiting factor of proximity MP. An overwhelming majority of nonadopters referred to the contactless card as a benchmark to judge the convenience of proximity MP. This appears to be linked to
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the belief that extra steps would be involved to initiate the payment app as opposed to the contactless card that is always ready for payment.

“In fact I feel having to take out my phone and unlock the phone, hit the app, and hope it all works, will probably be less convenient and less efficient than just taking out my wallet and my card” (P3)

“I don’t think that you could get more convenience than [contactless card], unless you put a microchip in your wrist” (P21)

More interestingly, some nonadopters expressed their willingness to consider using proximity MP if a clear benefit is offered over using a contactless card despite the perceived risks they mentioned. Consequently, the degree to which an added value is perceived from using proximity MP appear to have a significant effect on minimizing both the impact of the perceived risks and the attractiveness of existing payment alternatives.

“The main barrier that needs to be overcome is that I don’t see enough other reason to try to overcome them [the risks]. Those risks can be mitigated, I don’t get enough value out of taking those risks” (P10)

“I just haven’t really understood how it will benefit me over what I am doing at the moment” (P23)

4.8 Lack of knowledge

A further new value-inhibiting factor pertaining to the lack of sufficient information about the setup and use of proximity MP emerged among nonadopters. Lack of information about the different parties involved in the MP system and the payment process was explicitly mentioned by nonadopters.

“…when I want to use my phone to pay, I don’t know I’ll have to start an application or something I am not even sure how does it work” (P13)

“It is a matter of not feeling like I understand what I am signing up to” (P22)

The increasing popularity of the contactless card among consumers has consequentially led to high acceptance rate of proximity MP among merchants, as both payment methods utilize the same underlying NFC technology (Madureira, 2017). However, some nonadopters have differentiated between acceptance of contactless card payment and proximity MP due to insufficient information about the latter.

“I wouldn’t know if I would have to place a mobile phone on a … card machine or on a separate thing I am not entirely sure” (P15)
Understanding Perceived Value of Mobile Payments: A Qualitative Study

“at the minute I assume that 95% of shops will accept the contactless card but my assumption is probably they are only 50% will accept the NFC payment”

(P16)

Contrasting what adopters described about the convenience of using proximity MP, lack of knowledge was also implied in nonadopters perceptions about the extra steps involved in using proximity MP as mentioned earlier. This explains the reason behind perceiving proximity MP as more time consuming at checkout than using a contactless card. In addition, lack of information about the similarity of the technology that underlies both contactless cards and proximity MP among some nonadopters appears to negatively influence their perception of MP acceptability in favor of contactless cards.

5.0 Discussion and future research

This study contributes to MP perceived value literature by introducing contextualized interpretations of the determinants of value as contrasted by both adopters and nonadopters. Table 2 outlines the items emerged for the different value determinants based on participants’ identifications.

<table>
<thead>
<tr>
<th>Value determinant</th>
<th>Identified item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convenience</td>
<td>Ubiquity of mobile phone&lt;br&gt;Quick and easy payment&lt;br&gt;For small amount payments</td>
</tr>
<tr>
<td>Monetary</td>
<td>Does not help to save money&lt;br&gt;Occasional overspending due to ease of access&lt;br&gt;Includes no additional cost</td>
</tr>
<tr>
<td>Enjoyment</td>
<td>Quick and easy&lt;br&gt;Satisfying sound notifications following successful payments&lt;br&gt;Intuitive layout</td>
</tr>
<tr>
<td>Social</td>
<td>Look like others&lt;br&gt;Purposeful use of technology</td>
</tr>
<tr>
<td>Perceived trust in provider</td>
<td>Provider size&lt;br&gt;Regulated provider&lt;br&gt;Provider reputation</td>
</tr>
<tr>
<td>Perceived risk</td>
<td>Phone loss or theft&lt;br&gt;Phone battery outage&lt;br&gt;Mass data breach&lt;br&gt;Privacy misuse</td>
</tr>
<tr>
<td>Existing alternatives</td>
<td>Contactless card convenience&lt;br&gt;No clear benefit over contactless card</td>
</tr>
<tr>
<td>Lack of knowledge</td>
<td>No idea how MP works&lt;br&gt;MP involves many extra steps&lt;br&gt;Less accepted than contactless card</td>
</tr>
</tbody>
</table>

Table 2. Determinants of value
The study further provides a preliminary evidence about the significance of these determinants and their interrelationships. As a starting point of investigation, determinants from the perceived value theory in addition to perceived trust and risk were employed.

5.1 Theoretical implications

The findings suggest that convenience is the key positive determinant of proximity MP value as perceived by adopters. However, nonadopters were heavily influenced by their contactless cards experience that seem to be blocking any need to look for alternatives. This finding was evident from the lack of information exhibited by most nonadopters about scenarios of use and merchant acceptance of existing MP services as opposed to adopters. In addition, nonadopters who recognized the convenience of MP have questioned the need for a new method that, at its best, duplicates the convenience of contactless cards without offering a tangible benefit. These findings suggest the salient direct value-inhibiting effect of existing alternative payment methods on perceive value of proximity MP. Indirect effects were also evident from the negative influence on perceived convenience and the positive influence on lack of knowledge. Although previous studies confirmed the negative effect of attractiveness of alternatives on perceived value of other technologies (Lin et al., 2012), this factor has been largely overlooked in value-based MP adoption research. In addition, previous research on Internet banking indicated that lack of information increases uncertainty and perceptions of risk (Kuisma, Laukkanen and Hiltunen, 2007), however the above findings further suggest that lack of knowledge poses a negative effect on perceived convenience and value of proximity MP. Therefore, this study suggests including both alternative payment methods and lack of knowledge as sacrifice factors in future value-based MP research.

Enjoyment and social benefits were fairly recognized by adopters and nonadopters, however they placed less emphasis on their effect on MP value as compared to convenience. More specifically, enjoyment was derived mainly from convenience related aspects rather than being a prominent value determinant as indicated by previous studies (de Kerviler, Demoulin and Zidda, 2016). This could be attributed to the utilitarian nature of MP services where participants placed more emphasis on fulfilling the payment task while recognizing the emotional aspect as a by-product of how the task was fulfilled. Similarly, social value appears to be more recognized by the youngest age group, suggesting the less predictive effect of social value among
other age groups. Moreover, in line with previous studies (Pura, 2005), contrasting between the components of functional value, i.e. convenience and monetary values, has proved to be important. Contrary to convenience, the findings suggest that proximity MP does not provide any significant monetary value as perceived by participants due to not seeing any difference in terms of cost and spending across all payment methods. Therefore, the findings of this study suggest that future value-based MP research should recognize convenience and monetary values as separate constructs.

In accordance with previous research, perceived risks related to the phone as a device subject to being lost or out of charge along with other general privacy concerns were found as another value-inhibiting factor mainly visible among nonadopters. Nevertheless, their narratives also implicate that the negative effect of these risks appears to be less observed compared to the effect of existing alternatives on MP value. This finding was evident in two aspects. First, from the willingness demonstrated by some nonadopters to ‘mitigate’ these risks should they perceive an additional benefit not offered by current payment methods. Second, by acknowledging the effectiveness of the extra security measures provided by the mobile phone, i.e. fingerprint and passcode authentication, in comparison to contactless cards in case of loss or theft. Thus, taking into consideration the importance of trustworthiness of MP service providers as a risk-inhibiting factor confirmed by most participants, this study concludes that the central value-inhibiting factor remains in the existing alternative payment methods.

5.2 Practical implications

In light of these findings, this study suggests that a more effective communication of the benefits provided by MP services is needed. Contrasting the functional advantages of MP in terms of usability and security features as compared to contactless cards could possibly lead to a better understanding of the limitations of the latter. Moreover, the largescale deployment of the major MP wallet apps in the UK such as Apple Pay couldn’t be possible without the involvement and support of the main financial institutions. Therefore, highlighting this central role of financial institutions as highly trusted entities could effectively enhance perceptions of trust in the providers of these wallet apps. Finally, MP wallet providers should start to rethink the value proposition of their solutions in comparison with existing market offerings. The superiority of smartphones lies in their extended computing, communication and display capabilities.
that are not available in traditional payment instruments. By taking advantage of these resources, extra functionalities could be added to enrich the payment experience and bring more visible benefits while maintaining a level of convenience that matches that of the existing instruments as a minimum.

5.3 Limitations and future research

The qualitative nature of this study presents the limitation of the small sample size. Therefore, care must be taken in generalizing the findings to a wider population. A possible extension of this study could be through a quantitative follow-up study that takes into consideration the generated items to guide item selection. Also, the high subjective nature of value means that different consumers perceive values from different perspectives. Therefore, future studies could include personal characteristics such as innovativeness to gain more insight about how personality traits affect perceptions of value. Lastly, since these findings were validated within MP context, further research is needed to investigate their applicability to other technologies.

References


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Measuring user emotionality on online videos: A comparison between self-report and facial expression analysis.

Abstract

One common factor that unites the popularity of online video viewers is their virality. Marketers and academics have been involved in the contemporary research not only to understand how online virality occurs but in addition how it can be measured. Thus, the aim of this paper is threefold: a) to advance the understanding of what online video virality is b) to propose a conceptual framework for measuring video virality c) to evaluate two main contrasting methods for measuring video virality. The conceptual framework identifies key elements to video virality as emotions and social groups, and the tools proposed to be used for measuring online video virality is the FaceReader and the online web questionnaire. The findings from the study indicate the existence of discriminant validity between the two methods which inherently adds to the theoretical advancement with the notion that video marketers or researchers cannot use self-report to measure emotions or use it synchronously with facial expression analysis on online videos.

1.0 Introduction

The need to obtain views from online sharing platforms such as YouTube is important as viral views provide free advertising and beyond it can represent deeper brand engagement which allows for further interaction such as replaying the video, rating it (liking or disliking), adding a comment and most significantly forwarding it to a friend to continue the viral cycle (Southgate, Westoby and Page, 2010). Viral videos have had a profound social impact of many aspects of society such as politics and online marketing. For example, during the 2012 US presidential election, Obama style and Mitt Romney style, the parodies of the famous Gangnam Style, both peaked on election day and received approximately 30 million views within a month before election day (Jiang et al., 2014). Teixeira et al. (2012) explains that viral video ads are increasingly being used by advertisers as brand building tools because of their potential to engage viewers more than traditional TV ads. The reasoning is that the sharing of these ads among acquaintances increases attention and interest. Further, since it requires little to no paid media, viral ads are also viewed as a lower cost approach to television. Keane (2010) disagrees and reckons that the key to a viral video success relies on a big add budget. The argument is that videos that got watched the most on the Internet are those that bought their popularity through traditional offline advertising, especially on TV. The fact is that the relationship between an advertising budget and a video's popularity online is not the same as the connection between online popularity and box office revenue. Notwithstanding, the challenge that brands face in using viral ads is that it is a very uncertain process with many more ads failing to reach a sizable audience than succeeding (Watts and Peretti, 2007), One key explanation for this is that we still know very little about what content causes ads to go viral (Godes et al. 2010). Berger (2013, p. 6) affirmed that there’s “no difference in price (all are free to watch) on videos, and few videos receive any advertising or marketing push. Although some videos have
higher production values, most that go viral are blurred and out of focus, shot by an amateur on an inexpensive camera or cell phone, so if quality, price and advertising doesn’t explain why one YouTube video gets more views what does?”.

To answer that question Porter, Lance and Golan (2006) explains that it is primarily due to content, Bampo et al (2008) point to social network structure, Wonjnicki and Godes (2011) indicate seeding strategies whilst Dobele et al., (2007); Berger and Milkman (2012); Nelson-Field,Reibe and Newstead (2013) assume elements of emotional arousal. This paper leans towards the premise that emotions are an important catalyst for virality based on the conclusions from the findings and the varying methods used to measure emotional content within its distinct context. After people have experienced an emotional response to content, they consider the option of passing the content on to their social networks (Feder,2014). Rime (2009) shows that when people have emotional episodes they tend to interact socially. The Social Sharing of Emotion theory explains why people aim to connect with others after emotional experiences, and how this sharing of emotional content, in turn, causes emotional reactions in others (Christophe and Rime,1997). Online social networks provide viewers with an immediate avenue to socially share the emotions that were elicited by the content. Within the social network an individual’s group (i.e fan base) is a moderating factor on the extent a video will be shared once the element of emotion has been amplified. For example, a Manchester United football fan will not share an amusing video content with other people of a rivals Arsenal player scoring a wonder goal even though the video has positively elicited the fan.

The key question then is how can we measure emotions and incorporate social groups to ascertain the extent a video stimulus has gone viral since it has been established that there is a direct correlation? Kuilenberg, Wiering and Uyl (2005) noted that apart from the means to identify other members of the species the human face provides several signals essential for inter-personal communication in our social life, personality, attractiveness, age and gender can also be seen from someone’s face. Thus, the face is a multi-signal sender/receiver capable of tremendous flexibility and specificity. In turn, automating the analysis of facial signals would be highly beneficial for fields as diverse as security, behavioural science, medicine, communication, education, and human-machine interaction. An example is the Facial Expression Analysis Tool also known as the FaceReader. The FaceReader can categorize expressions corresponding to one of the 6 basic emotions as defined by Ekman (1992) plus neutral and categorises the emotional valence of the expression and some personal characteristics like gender and age. It also allows a user to set other independent variables that cannot be automatically captured that meet the objectives of the study such as employment and location. The use of a questionnaire embedded with a video stimulus can also be used to gain a objective insight on a user’s emotionality.

1.1 Theoretical Framework

After people have experienced an emotional response to content, they consider the option of passing the content on to their social networks (Feder,2014). Rime (2009) shows that when people have emotional episodes they tend to interact socially. The Social Sharing of Emotion theory explains why people aim to connect with others after emotional experiences, and how this sharing of emotional content, in turn, causes emotional reactions in others (Christophe and Rime,1997). Online social networks provide viewers with an immediate avenue to socially share the emotions that were
elicited by the content. Viral marketing authors contend that there are various social reasons why people share content online: to increase their status (Chu, 2011; Lagger et al., 2011; Roy, 2011), out of altruism (Phelps et al., 2004; Roy, 2011), to allow others to laugh (Lagger et al. 2011; Roy, 2011), to inform others (Lagger et al., 2011), or for economic incentives (Roy, 2011). However, authors disagree about which specific social reasons drive the sharing of content online. These social motivations for the spread of content online need further investigation especially within a theoretical context.

Rime et al. (1992) explored the phenomenon as to whether people share their emotions, whether they do it more readily than others, how often and with whom they speak about such experiences. The findings showed that most emotional experiences are shared with others shortly after they have occurred, and that social sharing of emotions represents an integral part of emotional experiences. Wagner et al. (2014) supported the stance to explain that one of the most fundamental characteristics of human beings is their social nature where there is a need to form social bonds to share experiences. By socially sharing their experiences individuals can modify their subjective perceptions of these experiences in a positive manner. Wagner et al. (2014) illustrated that when people go to the cinema, they rarely do so alone but in most cases go together with a partner or a friend. Apart from expecting to be emotionally moved by the film itself, they anticipate a positive impact of sharing this emotional experience with a peer, even though both are passively watching an event and there are only minimal opportunities to talk to each other during the viewing.

The Social Identity Theory was first proposed by Tafjel (1979). It is a theory that explains cognitions and behaviour of people with the help of group processes (Trepte, 2006). According to the Social Identity Theory (SIT), people tend to classify themselves and others into various social categories such as organisational memberships, religious affiliations, gender and age cohort, fans of a TV series, sporting clubs or members of a university etc (Trepte, 2006). Stets and Burke (2000) noted that a social identity is a person’s knowledge that he or she belongs to a social category or a group. A social group is a set of individuals who hold a common social identification or view themselves as members of the same category. Through a social comparison process, persons who are like the self and are labelled the “in-group”; persons who differ are categorized as the “out-group” (Stets and Burke, 2000).

An aspect of social identity is social validation which is the tendency for individuals to look to others to see what others are doing to determine if a behaviour is normative and appropriate (Guadagno et al., 2013). In environments where the correct course of action is ambiguous, people rely even more heavily on the cues provided by others. People are also more likely to follow the cues of others when the others are a member of their in-group and thus more like them. In a one such study, Salganik, Dodds, and Watts (2006) created a laboratory “music market” online where 14,000 participants could download songs they had never been exposed to previously. The researchers manipulated whether participants were made aware of other participants’ choice to download a song. The results of the study demonstrated that increasing cues of social validation (providing participants with knowledge of other participants’ download choices) decreased the predictability of success based on song quality. Thus, in relations to online videos, when one receives a forward from an in-group member, that may serve as a signal that the video is appropriate to forward to others. To contextualise a Salford City Football fan
who attends either home and away games of the team, buys the clubs paraphernalia and merchandise, will watch and share football video highlights on YouTube with fellow Salford City football fans who have a strong inclination to associate with the ideals and do likewise. Such a strong inclination to identify and participate within an emotional context can be further explained using the conceptual framework as seen below:

1.2 Conceptual Framework

![Conceptual Framework Diagram](Diagram)

Figure 1. Framework for measuring virality.

The conceptual framework underscores that a viral video is dependent on psychological aspect called emotions. The emotionality elicited are derived from a set of both football fans and non-football fans (The football fans are not necessarily Salford City Fans, but fans of football who may support other opposing teams). Emotional experiences can be described by positive and negative emotions. Social Identity (groups) determines the relationship strength between a viral video and emotions within the context of football related videos (i.e. moderating variable). Virality is the outcome from the effect from emotions and social identity groups. The notion of what virality is subject to debate and is often contradicted. For example, Adweek regards the number of shares as the metric to assess the virality of an online advertisement (Nudd, 2014) whilst AdAge.com (2015) highlights the number of views. This paper encapsulates and combines both views and shares where virality is denoted in this paper by the extent a video is shared over a period as it accumulates views. In the conceptual framework the emotions are independent variables whilst the viral and non-viral videos represent the dependent variable.

2.0 Methodology

Dobele et al., 2007; Berger & Milkman (2012); Feroz Khan & Vong (2014) used a set of questionnaires and textual coding to conduct their studies to conclude that certain emotions when elicited cause sharing whilst Southgate et al., (2010) used interviews. Similarly, Zaman and Smith (2006); Harley (2015) used the FaceReader in conjunction with other methods albeit in a different context. This study on the other hand assessed
the use of the FaceReader recognition software in relation to online web questionnaire embedded with video stimuli.

2.1 Participants

A total of 60 respondents (32 football fans and 28 non-football fans) filled both the online web questionnaire and undertook the facial expression analysis which was used as the main basis for the study. The respondents comprised lecturers and students from the university as well as carefully selected respondents selected from a freelance website (www.peopleperhour.com). On the PeoplePerHour page project bid page instructions on how to undertake the project with links to the testing page were provided. Participants from the PeoplePerHour website were selected after they sent a proposal. The proposal sent comprised the participants interest in undertaking the project, the time they will take to complete the project and the fee they will charge which has to be within the stipulated price quoted by the researcher for undertaking the project. The instructions took the participants to the testing page on Google forms which also had further instructions on how to undertake the project. Face to face participants were solicited via email or in person. Accepted proposals from the PeoplePerHour website took into consideration the gender and location, and whether they were football fans or non-football fans to get a balanced perspective from the participants.

Do note that where N < 32 football fans and N < 28 Non-football fans it is primarily due to some participants data being omitted as a result of calibration problems using the facial expression analysis software *.

2.2 Materials

To undertake the study the data was obtained from two methods which are objective and subjective in nature and were run concurrently. Subjective methods include questionnaires surveys which as the name indicates relies on the subjective nature of the responses which sometimes can lead to bias, in that participants offer the researcher information they think is wanted, rather than describing the reality (Wilson, 2002). Objective methods include observations, interviews, analysing written texts and documents etc. Oates (2006) explains that objective data is richer and more detailed and offers more than just numbers whilst also offering an alternative explanation rather than a presumption that there will be one correct explanation.

Users who participated in this research study had to be at a stationary sitting where they filled an online questionnaire using Google forms which contained embedded video content to which they had to watch 2 viral videos and 2 non-viral videos as they were recorded using the FaceReader 6 platform or they could do the test remotely (This also involved filling the online questionnaire and having a self-recording of themselves which was subsequently uploaded into a dropbox for further facial expression analysis). The online web questionnaire also measured each participant subjective self-report of their emotions and other factors such as the likelihood to share and how often they watch YouTube videos, whether they were football fans etc.

2.2.1 Video Stimuli

The first video depicted a wonderfully struck long-range goal from the centre of the football field reminiscent of strikes from more renowned professional footballers such as David Beckham, it was scored by an ex-Salford City player known as James Poole.
It is an organic video in its intrinsic sense, which means it did not have a huge production budget backed by a huge digital marketing campaign. The second video depicted Manchester United players acting for a pre-release trailer for a movie – “Independence Day Resurgence”. The second video had a huge production budget and was run with a digital marketing campaign. The two variant viral videos, one organic and one commercial were specifically chosen for a more robust comparative analysis. The third video showed ex-Manchester United Defender Gary Neville discussing the promotion of Salford City FC. The fourth video depicted a celebratory scene as Salford City FC gained promotion. All the videos were less than 4 minutes in length. The first and second video (viral videos) were chosen due to their widespread circulation – (Video 1 harnessing 64,476 views and 142 shares; Video 2 harnessing 257,757 views and 326 shares) and hypothesised ability to induce a measurable variation in the mean emotional intensities. The main variables measured using the facial expression analysis study were the mean emotion intensities of each participant as well as the valence and the arousal.

2.3 Experimental design

CIRT (2018) explains that experimental design is concerned with the effect of the examination of the independent variable, where the independent variable is manipulated through treatment of interventions and the effect of interventions. CIRT (2018) identifies three basic types of experimental research designs. These include pre-experimental designs, true experimental designs, and quasi-experimental designs. The degree to which the researcher assigns subjects to conditions and groups distinguishes the type of experimental design. CIRT (2018) makes a distinction on the different types of true experimental designs. True experimental designs are characterized by the random selection of participants and the random assignment of the participants to groups in the study. The researcher also has complete control over the extraneous variables. McLeod (2017) identified three types of experimental designs: Independent measures, repeated measures and matched-pairs whilst Oates (2013) noted: one-group, pre-test and post-test, static group comparison, pre-test/Post-test control group and Solomon four-group design. Some of the characteristics of the designs, pros and cons is examined in the table below:

<table>
<thead>
<tr>
<th>Design Type (Characteristics)</th>
<th>Pros</th>
<th>Cons</th>
<th>Does this study meet the criteria?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent Measures (Between groups). In this type of experimental design each condition of the experiment includes a different group of participants. This is done by random allocation which avoids order effect as people participate in one condition only. If a person is involved in several conditions, there is a tendency for boredom or fatigue.</td>
<td>It usually involves a lot of participants. Differences between participants in the groups may affect results, for example: variations in age, gender or social background. These differences are known as participant variables.</td>
<td>No, as this study requires the same set of participants.</td>
<td></td>
</tr>
</tbody>
</table>
| Ensures that each participant has an equal chance of being assigned to one group or the other. | Repeated Measures (Within groups). Each condition of the experiment includes the same group of participants. | As the same participants are used in each condition, participant variables (i.e., individual differences) are reduced.

Fewer people are needed as they take part in all conditions (i.e., saves time). | There may be order effects. **Order effects** refer to the order of the conditions influencing the participants’ behaviour. Performance in the second condition may be better because the participants know what to do (i.e., practice effect). Or their performance might be worse in the second condition because they are tired (i.e., fatigue effect). This limitation can be controlled using **counterbalancing**. | Yes, as all participants partake in both methods (i.e, facial expression analysis and self-report (questionnaire) and are subject to the measurement of their emotions elicited from watching the same two video stimuli. |

| Matched – Pairs. Each condition uses different but similar participants. An effort is made to match the participants in each condition. In terms of any important characteristic which might affect performance, e.g., gender, age, intelligence, etc. | Reduces participant variables because the researcher has tried to pair up the participants so that each condition has people with similar abilities and characteristics. | If one participant drops out, you lose 2 personal participants data. | No, the participants are the same in both conditions. |

| One – group, pre-test and post-test. The participants performance is measured, the researchers then | By comparing the before and after scores, the researchers can assess the effects | The researchers cannot determine if time have had an effect – the participant might have just gotten better with | No, the test condition is done in parallel and not using a pre-test and |
apply some treatment, they then measure the participants performance again.

of the treatment efficiently.

time without the researcher’s input.

post-test approach.

Static group comparison. The participants are divided into two groups. The researchers apply the treatment to one group and do nothing to the other group. The performance of both groups is then measured.

Difference in groups can be explained by the treatment.

If participants are not randomly assigned to the two groups, any difference might be caused by other factors than the treatment.

No, as the treatment is applied to both groups.

Solomon four – group design. This design controls for the possibility of pre-testing affecting subsequent performance. Participants are randomly assigned to four groups. Using the Solomon four-group design, subjects are randomly assigned to one of four different groups. Two of the groups receive the treatment (i.e. intervention) and two do not (i.e. control).

Researchers using this design can examine both the main effects of testing and the interaction of testing and treatment.

It is expensive because of the number of participants needed.

The researcher is also able to examine the combined effect of maturation and history by comparing, (the post-test only control group) and (the pre-test control group).

There is difficulty in introducing the treatment simultaneously for all groups.

No, participants are not randomly assigned to 4 groups.

Table 1. Experimental design types considered.

The experimental design in this study typifies a repeated measures approach whereby the first viral video stimulus was hypothesised to elicit mainly surprise whilst the second was happiness (Positive emotions). The first video depicted a wonderfully
struck long-range strike from the centre of the football field reminiscent of strikes from more renowned professional footballers. The second video depicted Manchester United players acting for a pre-release trailer for a movie – “Independence Day Resurgence”. The first and second video were chosen due to their widespread circulation – (Video 1 harnessing 64,476 views and 142 shares; Video 2 harnessing 257,757 views and 326 shares) and hypothesised ability to induce a measurable variation in the mean emotional intensities. The main variables measured using the facial expression analysis study were the mean emotion intensities of each participant as well as the valence and the arousal.

2.4 Procedure

On site participants were required to read a participation information sheet and sign an ethical approval form prior to the start of the study. The participant information sheet depicted the entire process they will go through as well as the scope behind the study. Remote participants had to do likewise and check an online web form that stated that they agree with the modus operandi. Participants who took the study remotely were instructed to record themselves with any suitable recording software and a high definition webcam, onsite participants had access to a testing suite, a laptop using the Face Reader 6 software and webcam. To organise the data and analyse the results a statistical tool - SPSS - was used for advanced inferential statistical analysis.

2.4.1 Facial Expression Analysis

Facial expression instruments are based on theories that link expression features to distinct emotions. Examples of such theories are the Facial Action Coding System (Ekman and Friesen, 1978), and the Maximally Discriminative Facial Moving Coding System. Generally, visible expressions captured on stills or short video sequences are analysed. An example is the Facial Expression Analysis Tool. According to Loannou et al., (2005) Facial features and expressions are critical to everyday communication. Besides speaker recognition, face assists several cognitive tasks: for example, the shape and motion of lips forming visemes can contribute greatly to speech comprehension in a noisy environment. While intuition may imply otherwise, social psychology research has shown that conveying messages in meaningful conversations can be dominated by facial expressions, and not spoken words. This result has led to renewed interest in detecting and analysing facial expressions in not just extreme situations, but also in everyday human–human discourse. A very important requirement for facial expression recognition is that all processes therein must be performed without or with the least possible user intervention. This typically involves initial detection of face, extraction and tracking of relevant facial information, and facial expression classification. Benta et al. (2004) described FaceReader as a system for fully automatic real time facial expression analysis developed by VicarVision and commercially available since 2007. It is currently used worldwide for numerous (consumer) behaviour studies. The software tool can process still images, video and live camera feeds and produces approximately 15 analysis results per second on a modern PC, allowing it to be used in real-time. FaceReader can classify expressions corresponding to one of the 6 basic emotions as defined by Ekman plus neutral and classifies the emotional valence of the expression and some personal characteristics like gender, age and ethnicity.
2.4.2 Self – Report (Online web Questionnaire Survey)

In a web-based questionnaire the researcher places a question on the web and respondents are asked to complete and submit it electronically. Oates (2006); Saunders et al., (2003) identify the advantages of deploying an online based questionnaire as the following:

- Data obtained can come from many people in different part of the globe.
- Visitors to a website could be asked to complete an online questionnaire.
- Respondents can answer easily and quickly (Saunders et al.,2003)
- Audio and video can be embedded in a web questionnaire (The use of video was pivotal to the study).

2.5 Evaluation (Concurrent Validation)

Salkind (2010) explains that results of a concurrent validation study are typically evaluated in one of two ways which is determined by the level of measurement of the scores from the two measures. When the scores on both the new measure and the criterion measure are continuous, the degree of concurrent validity is established via a correlation coefficient. Cohen and Swerdlik (2009) elucidate that the validity coefficient is a correlation coefficient that provides a measure of the relationship between test scores and scores on the criterion measure. The concurrent validity of the test (i.e. facial expression analysis in this study) is explored with respect to another test (i.e. questionnaire survey). In this case, prior research has satisfactorily demonstrated
the validity of the use of the facial expression analysis Benta et al. (2004); Terzis, Morides and Economides (2010), so the question becomes: “How well does facial expression analysis compare with a questionnaire survey?” Here, Test B (i.e questionnaire survey) is used as the validating criterion. Thus, to test if the methods corroborate each other (i.e. observation data from facial expression analysis and questionnaire survey) it was integral to cross-validate using a spearman’s correlation to test the methods in relation to the basic emotions represented. Ostensibly, the data shows the significant correlations from the tests undertaken based on the hypothesis that:

**H1: There is a strong positive correlation between emotions data obtained from facial expression analysis and survey data among Football fans.**

### 3.0 Results

There are two main implications of undertaking the validity test i.e. where both methods are right and thus show mutual association for the emotions or one method is right, and the other less effective to be used in a research study. The initial results have shown that there exists minimal relationship between the two methods (i.e existence of discriminant validity which tests whether measurements that are not supposed to be related are unrelated). The results have indicated only three significant results (anger, surprise and sadness) out of 24 tests where $r (31) = -0.398, p = 0.027, p < 0.05$; $r (31) = 0.081, p = 0.035, p < 0.05$ and $r (31) = -0.415, p = 0.020, p > 0.05$. A summary of the validity coefficient indicates that the methods were correlated for only viral video 2 when measuring surprise, anger and sadness in football fans. Sadness indicated a negative correlation which is ambiguous within the scope of the study. In contrast the same video when comparing the emotion of anger in non-football fans also indicates that there is no correlation between the two methods. A further insight into the tests show that the results were significant at a 95% confidence significance level which will support the argument that the likelihood of the significance occurred by chance as opposed to if it had occurred at a more robust confidence level of 99%. The significance of the results is that self-report cannot (i.e validating criterion) cannot be used to measure emotions or be used synchronously with facial expression analysis to reach the same conclusion from their corresponding datasets. More so, it has been established from prior studies that the facial expression analysis software is more effective method for measuring emotions on its own merit (Terzis, Morides and Economides, 2010; Danner et al.,2013) and supersedes that of a questionnaire survey when used collectively (Zaman and Smith,2006). The scatter plot diagrams below show further evidence of discriminant validity where an inverse relation is shown between the two methods depicted by a negative downward slope.
3.1 Conclusions

To support the premise from this research that the validating criterion (i.e. questionnaire) is not an effective method for measuring emotions it will be important to assess the study undertaken by Harley (2015) who also evaluated different methods in measuring emotions. Harley (2015) noted that Self-report measures (i.e. questionnaires) is the most widely used method to measure emotions and are based on participants’ self-reported (perceived) experience of emotions, rather than behavioural or physiological emotional information. Although self-reports are flexible regarding when they can be administered (e.g., before, during, or after a learning session) they are, strictly speaking, offline measures because participants are interrupted, and their attention is redirected from the emotion eliciting stimuli.

Harley (2015) explained that although self-reports are ubiquitous in educational, cognitive, and social psychology research, there are many well-known shortcomings with this method that are relevant to measuring emotions. One of the major shortcomings is asking a participant to rate their perception of having experienced an emotion. As such, the accuracy of one’s self-reported emotional state can be undermined by the following: (1) never having experienced that particular emotion; (2) being unable to accurately remember an instance of a particular emotion; (3) having a different meaning or understanding (than the researcher) associated with the emotional term or label; (4) being reticent to espouse the experience of negative emotions during their interaction with the video stimulus due to social desirability; (5) time span between experiencing a particular emotions and being asked to report the emotion; or (6) the self-report measure eliciting a different emotion (e.g., boredom) than that experienced prior to its administration. Given the potential for self-report measures to influence the emotions they purport to assess, and the unique influence of self-report measures on emotions relative to other psychological states and processes as measured by self-
reports measures. The research showed that self-reports are inadequate to solely elicit and gain a comprehensive understanding of one’s subjective thoughts and other methods will need to be utilised. To cite an example, during one of the tasks a participant verbally indicated that he was disgusted to see Wayne Rooney (Ex-Manchester United Player) and other Manchester United Stars and even though he was an Arsenal football fan and liked the movie trailer video he will not share it due to the dislike of the team, whilst another participant (Liverpool FC fan) felt the ties Salford City Football Club had to Manchester United through the class of 92 was an enough put off not to share the video even though the video was amusing, it was just not the type of content that will be shared but may verbally “tell” others about it. It appears, therefore, that the mechanisms driving viral content are not isolated to the online environment.

Harley (2015) depicted that in response to the various drawbacks of self-report measures, there are several steps that researchers can take to address some of these issues such as providing definitions for the emotions and emotional terms participants are asked to use in reporting their emotional experiences. While definitions of emotions may differ between researchers, this approach makes the researchers’ and participants’ operationalisation of emotions more transparent. Additionally, researchers can administer self-report measures while participants are interacting with the video stimulus to reduce the likelihood that they will not accurately remember the emotions they were experiencing (This was offset in this research as a web questionnaire embedded with video stimulus was used). Accuracy of recall for retrospective self-report questionnaires may also be improved by showing learners footage of their learning session and facial responses during the session. Finally, to decrease item fatigue and the possibility of negative emotions, researchers can also use single-item questions to assess emotions.

3.2 Future Work

The future study proposes to take an in-depth look at the Emotional Retrospective Think Aloud (ERTA) method in conjunction with facial expression analysis. The ERTA emotion measures feeling where users are asked to elicit the emotions in words when a video is usually replayed after an eye tracking session (Petrie and Precious, 2010). The additional qualitative approach will provide insight that cannot be captured by facial expression analysis and self-report with an additional focus on the nuances of “why”?

References


The Effect of Behavioural Beliefs on Smart Home Technology Adoption.

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The topic areas:

IS Innovation, Adoption and Diffusion
Human-Computer Interaction
Artificial Intelligence systems
Technologies to Promote a Healthy and Secure Society
The Effect of Behavioural Beliefs on Smart Home Technology Adoption

This cross-sectional study examines the factors affecting smart home technology use in private spaces. Specifically, the role of hedonic and utilitarian beliefs has been examined in the formation of smart technology use behaviour. In addition, this study is aimed at a better understanding of the outcome of smart technology use in terms of individuals’ satisfaction, the perception of their well-being and perceived value. A sample of 422 smart home technology users participated in this research by completing an online survey. Structural equational modelling was used to analyse the relationship of the constructs employed with smart home technology use. This exploratory study found a strong effect of the use of smart home technology on subjective wellbeing, satisfaction and perceived value. The findings of this paper contribute to our understanding of smart technology acceptance by highlighting the importance of behavioural beliefs. In addition, they provide empirical evidence of the outcome of the use of smart home products.

Keywords: Technology Acceptance, Smart Home, Behavioural Beliefs, Technology Use Behaviour
The Effect of Behavioural Beliefs on Smart Home Technology Adoption

1. Introduction

The application of technology beyond the workplace has been gradually increasing year by year. A number of technical devices have been specifically designed for use inside a house (Kapoor, 2004). Household devices have been constantly developing and triggering the growing interest of scholars (Venkatesh, 1996, Brown and Venkatesh, 2005). The latest advances in the information systems literature refer to appliances that aim to make a home a smart one (Chan et al., 2009, Balta-Ozkan et al., 2013a, Marikyan et al., 2019). The term “smart home” can refer to any form of residence which integrates interconnected devices and appliances to fulfill and ease the daily routine tasks (Balta-Ozkan et al., 2014). The concept of a house embedded with technology that is capable of bringing health-related, environmental and financial benefits (Balta-Ozkan et al., 2013a, Chan et al., 2009, Demiris and Hensel, 2009, Bhati et al., 2017) has triggered many large technology companies to embark on developing smart home products (Yang et al., 2017, Toschi et al., 2017). Even though smart home technology is capable of providing significant benefits to users, the realisation of these benefits on a large scale is yet to be seen due to a low acceptance rate (Marikyan et al., 2019). This means there is a need to explore those factors that underlie the acceptance of smart homes by users.

Despite emerging tendencies and trends, the literature still has a dearth of research on the acceptance of smart homes. Current research reflects a narrow focus on technology. However, in a broader sense, smart homes represent an intimate and private environment, which is inhabited by multiple actors having different psychological values and beliefs (Choe et al., 2011). Consequently, this study aims to contribute to the literature on the acceptance of technology in the context of private spaces, which has been an under-researched area so far. In addition, it will provide an empirical insight into the outcomes of behaviour in terms of satisfaction, subjective well-being and perceived value.

In the following section we will review the literature on smart homes, while in the subsequent section we will introduce the theoretical framework and put forward several hypotheses. The paper then discusses the adopted methodology and presents the results of the analysis. The paper concludes by proposing a number of future research avenues.

2. Literature review.

2.1 Smart Homes

A widely-utilised definition of the smart home has been developed by Aldrich (2003), who defined it as “a residence equipped with computing and information technology, which anticipates and responds to the needs of the occupants, working to promote their comfort, convenience, security and entertainment through the management of technology within the home and connections to the world beyond”. The main technical attributes of a smart home are: a) an established communication platform of interconnected devices; b) a degree of artificial intelligence that manages and controls the smart home technology system, c) embedded sensors that collect information, and d) smart attributes (e.g. a smart lighting or heating system), which can automatically respond to the information gathered through sensors (Balta-Ozkan et al., 2013a).

The services that a smart home provides can be categorised into three groups: lifestyle support; energy and consumption management; and safety and security (Balta-Ozkan et al., 2013a, Marikyan et al., 2019). Lifestyle support refers to a broad area, embracing such types of activities as communication, entertainment, assisted living, provision of e-health and comfort. The application of smart home technology in daily routines has been shown to improve users’ well-being by diminishing the feeling of isolation, as well as promoting independent living for an ageing population (Coughlin et al., 2007). Energy and consumption management is possible through effective monitoring and the
management of energy usage behaviour. Interconnected technologies perform daily routine activities such as house heating, water heating, light management, the search for cheaper energy providers, the termination of energy loads and the regeneration of energy through solar panels. The last group of services is security and safety, which can be achieved through an embedded recognition system, remote cameras and motion sensors. The system can perform real-time health diagnostics, it sets reminders for taking medications and even provides the possibility of virtual hospital visits (Ding et al., 2011, Chan et al., 2009).

The literature lists a significant number of benefits that smart home services are capable of bringing (Balta-Ozkan et al., 2013a, Chan et al., 2009, Demiris and Hensel, 2009). The benefits can be classified into three groups: health-related, environmental and financial ones (Marikyan et al., 2019). The dominant attention of studies is focused on the contribution of technologies to independent living, and the monitoring and management of the occupants’ health status (Alaiad and Zhou, 2017). In addition, smart home technologies can diminish the feeling of isolation and improve psychological well-being. This is achieved through the provision of assistance and support in daily routine activities, inducing a feeling of companionship. The attention to long-term environmental benefits of a smart home has been facilitated by increasing concern with global warming, climate change and fluctuating energy prices. The assurance in environmental sustainability has drawn upon the ability of smart home technology to reduce energy usage and the carbon footprint. The financial benefits of smart home technology are usually connected to environmental and health-related benefits. Users benefit financially from the utilisation of technology for the management of energy and water consumption (Bhati et al., 2017). While environmental sustainability is an ultimate long-term benefit, monetary saving is an immediate outcome. The transformation from traditional health services to home-care can also bring financial benefits in terms of savings of travelling expenses (Marikyan et al., 2019).

The examination of the perceived beliefs about the behaviour is one of the pillars in IT adoption research. Hence, this study will analyse how behavioural beliefs will affect the use behaviour. The following sections will describe the theoretical foundation of the study and hypotheses.

3. Theoretical Model

This study adopts the Unified Theory of Acceptance and Use of Technology (UTAUT) model developed by Venkatesh et al. (2003) as the starting point for examining the effect of behavioural beliefs on use behaviour. Behavioural belief is an individual’s assumption that performing a certain behaviour will lead to anticipated results (Paternoster and Pogarsky, 2009, Bulgurcu et al., 2010, Taneja et al., 2014). UTAUT is considered to be an eclectic theory, combining the well-established predictors in IT adoption research, such as perceived expectancy, effort expectancy, social influence and facilitating conditions. The adoption of the theory as a foundation for the study is justified as it has been widely tested and used in IT adoption research (Dermentzi and Papagiannidis, 2018, Chan et al., 2012, Yoo et al., 2012, Lu et al., 2019, Kim and Shin, 2015). Despite the recognition of the theory by scholars, it has been criticised on two counts. Firstly, UTAUT leaves out important predictors that might explain technology adoption (Bagozzi, 2007). In order to address this critique, this study will incorporate hedonic and utilitarian values. These two constructs refer to the beliefs about the positive outcomes of behaviour that have been identified through the extensive examination of the literature (Zeithaml, 1988, Babin et al., 1994, Venkatesh et al., 2003). Secondly, some studies provide evidence that the universal effect of social influence and facilitating conditions on use behaviour is debatable and dependent on contextual factors (Powell et al., 2012, Lian and Yen, 2014, Slade et al., 2015, Renda dos Santos and Okazaki, 2016). In addition, a number of studies have reported no significant effect of facilitating

Given the above, this study will integrate two UTAUT factors: performance expectancy and effort expectancy, with utilitarian and hedonic values to predict the use behaviour. The second part of the model will examine the outcomes of the use behaviour in terms of satisfaction, subjective well-being, social inclusion, perceived value and continuance intention to use. The detailed discussion of all constructs and hypothetical relations follow.

### 3.1. Behavioural Beliefs

**Performance expectancy**: Venkatesh et al. (2003) introduced and defined performance expectancy “as the degree to which an individual believes that using the system will help him or her to attain gains in job performance”. The authors developed performance expectancy based on five constructs from established models: extrinsic motivation (MM), a relative advantage (IDT), job-fit (MPCU), outcome expectations (SCT) and perceived usefulness (C-TAM-TPB, TAM and TAM2). The aforementioned constructs share a high degree of similarity (Davis, 1989, Thompson et al., 1991, Compeau and Higgins, 1995). A number of studies argued that the performance expectancy is a significant predictor of an intention and the use of technology (Agarwal and Prasad, 1998, Compeau and Higgins, 1995, Davis et al., 1992, Venkatesh et al., 2012, Al-Gahtani et al., 2007). UTAUT has multiple extensions that have been widely applied in different geographical and cultural settings. The results were consistent with the original findings, confirming the invariant effect of performance expectancy on intention and use behaviour (Al-Gahtani et al., 2007, Wang and Shih, 2009, Venkatesh and Zhang, 2010, AbuShanab and Pearson, 2007). Based on the past literature our first hypothesis is:

*Hypothesis 1: The performance expectancy will have a positive effect on the use behaviour.*

**Effort Expectancy**: Effort expectancy is defined “as the degree of ease associated with the use of the system” (Venkatesh et al., 2003). The authors took three constructs from well-established models: complexity (MPCU), perceived ease of use (TAM/TAM2), and ease of use (IDT). The sub-constructs that form the effort expectancy construct share a high level of similarity and have been found to have
The Effect of Behavioural Beliefs on Smart Home Technology Adoption

a significant impact on intention, both in voluntary and mandatory settings (Davis, 1989, Thompson et al., 1991). These constructs are significant only before an actual use or a trial (Agarwal and Prasad, 1998, Thompson et al., 1991). A number of studies in the technology acceptance field have scrutinised the role of effort expectancy (Venkatesh et al., 2012, Al-Gahtani et al., 2007, Venkatesh and Zhang, 2010, Brown et al., 2010, Martins et al., 2014). They provided evidence that effort expectancy acts as a significant predictor of technology use. Drawing upon the aforementioned research findings, this study hypothesises the following:

**Hypothesis 2:** Effort expectancy will have a positive effect on the use behaviour.

**Hedonic and Utilitarian Beliefs:** The literature claims that the intention to consume a product is heavily contingent on the hedonic or utilitarian values that drive users towards accepting the technology (Van der Heijden, 2004, Babin et al., 1994). Hedonic belief denotes self-fulfilment value. In the context of information systems, hedonic beliefs can refer to the degree to which the use of a system brings enjoyment and fun (Van der Heijden, 2004, Brown and Venkatesh, 2005). In contrast, utilitarian beliefs are rooted in the idea that the product brings instrumental value, such as increased task performance (Van der Heijden, 2004). Venkatesh and Vitalari (1992) found that users employ information technology in homes to satisfy utilitarian values. For example, smart home technologies can lead to financial savings and support health (Balta-Ozkan et al., 2014, Martin et al., 2008). Van der Heijden (2004) and Chen et al. (2017) also confirmed the dominance of hedonic motives in the acceptance of home technology. Particularly, the employment of smart technologies in the home context is triggered by the stimuli of personal satisfaction, self-education, entertainment and interaction with family and friends (Kraut et al., 1999, Brown and Venkatesh, 2005).

**Hypothesis 3:** Users’ (a) hedonic beliefs and (b) utilitarian beliefs will have a positive effect on the use behaviour.

3.2. Outcomes

**Satisfaction:** An extensive body of research is focused on information technology use and satisfaction (Román et al., 2018, Vlahos and Ferratt, 1995, Calisir and Calisir, 2004). The topic of satisfaction with technology use in the workplace has received extensive research attention (Vlahos and Ferratt, 1995, Elias et al., 2012, Isaac et al., 2017). For instance, employees’ use of technology in the workplace is positively related with the efficiency of the decision-making process and operations in an organisation, leading to increased satisfaction (Vlahos and Ferratt, 1995, Román et al., 2018). A number of studies have developed conceptual models to analyse the end-users’ satisfaction (Calisir and Calisir, 2004) and scrutinised its antecedents (Mawhinney and Lederer, 1990, Davis et al., 1989). A recent stream of research has investigated the influence of technology use on stress and job satisfaction (Román et al., 2018, Chung et al., 2015, Yueh et al., 2016). Based on the observation of (Vlahos and Ferratt, 1995), ICT has a significant role in achieving satisfaction, while the relation of use hours and satisfaction was found to be insignificant. The study also indicated that the satisfaction level is not consistent among employees. A number of other researchers have argued that the use of technology in the workplace can cause stress and dissatisfaction among employees (Ahearne et al., 2005, Sundaram et al., 2007, Tarafdar et al., 2014). This finding has been confirmed in a different context. For example, the research on the use of technology in higher education suggested that intensive use results in anxiety, which negatively affects satisfaction (Lepp et al., 2014). However, drawing on observations by (Duxbury et al., 2014), the utilisation of technology in the workplace makes it possible to ease the job-related stress of employees. A recent study by Román et al. (2018) confirmed the findings reported by Duxbury et al. (2014). The conflicting results can be linked to such factors as the availability of training on the use of technology and the technology's complexity. This assumption signals the need to examine the effect
of technology use on satisfaction by controlling other predictors of technology use. Based on the aforementioned discussion, we hypothesise that:

**Hypothesis 4:** The use of smart home technologies will have a positive effect on a user's satisfaction.

**Subjective Well-being:** Subjective well-being (SWB) is defined by researchers as an individual’s emotional reactions to events and is assessed by the opinions they hold about their life satisfaction and fulfilment. The phenomenon of SWB can be examined against the present and long-term periods (Diener et al., 2003). For example, El Hedhli et al. (2013) reported the positive effect of shopping on an individual’s well-being. In addition, many studies have questioned the causal effect of information system technology acceptance on users’ wellbeing and demonstrated the significance of the relationship of the two variables (Sum et al., 2008, Subrahmanyam and Lin, 2007). One of the recent studies by Hill et al. (2015) found that the use of technology in everyday life is positively associated with subjective well-being. Users recognised the empowering role of technology and its effect on relationships in society as well as its value for daily activities (Hill et al., 2015). Based on the aforementioned research studies, we hypothesise that:

**Hypothesis 5:** The use of smart home technologies will have a direct positive effect on subjective well-being.

**Perceived Value:** People differ significantly in the way in which the value of a product can be perceived. Zeithaml (1988) defined perceived value as a “consumer’s overall assessment of the utility of a product (or service) based on perceptions of what is received and what is given”. The definition derived from the idea that an individual evaluated and compared the “give” and “get” components of the selected service or product. Perceived value can be conceptualised as value for money, meaning a simple trade-off between quality and price (Cravens et al., 1988, Monroe and Rao, 1987). However, a number of studies have provided empirical evidence supporting the suggestion that this conceptualisation is too simplistic (Schechter, 1984, Bolton and Drew, 1991). For instance, (Porter, 1990) sees perceived value as a construct encompassing a number of dimensions, such as after-sales service, functionality and quality. In the IS literature, perceived value can take a very generic form, reflecting any of the social (e.g. social influence or subjective norms), hedonic (e.g. perceived enjoyment, fun or entertainment) or utilitarian benefits. For example, a recent study has examined perceived value in the extended technology acceptance model (Lu et al., 2019). This study found a significant relationship between continuance intention to use and perceived value. The findings replicated the results of the studies by (Partala and Saari, 2015) and (Kim et al., 2008). Similarly, there is a high correlation between perceived value and purchase intention (Ponte et al., 2015). In line with the above-mentioned studies highlighting the importance of perceived value in technology use and the acceptance context, we aim to explore the effect of smart home use behaviour on perceived value.

**Hypothesis 6:** The use of smart home technologies will have a direct positive effect on perceived value.
The Effect of Behavioural Beliefs on Smart Home Technology Adoption

4. Methodology

4.1 Data collection and sampling

This study adopted a quantitative approach. Before distributing the questionnaire to consumers, we conducted a pilot study. The data was gathered online by employing a consumer panel in the United States. The recruitment of the panel members was organised by an independent research company. 510 passed a screening question and were included in the final sample. The purpose of incorporating the screening question was to focus only on respondents who used or had used smart home technology in the past. The final sample that was used in this analysis consisted of 422 completed questionnaires (Table 1).

Table 1: Demographic characteristics

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Type</th>
<th>Frequency (n=422)</th>
<th>Percentages (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>195</td>
<td>46.20%</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>227</td>
<td>53.80%</td>
</tr>
<tr>
<td>Age</td>
<td>20-29</td>
<td>29</td>
<td>6.90%</td>
</tr>
<tr>
<td></td>
<td>30-39</td>
<td>50</td>
<td>11.80%</td>
</tr>
<tr>
<td></td>
<td>40-49</td>
<td>67</td>
<td>15.90%</td>
</tr>
<tr>
<td></td>
<td>50-59</td>
<td>96</td>
<td>22.70%</td>
</tr>
<tr>
<td></td>
<td>60-69</td>
<td>170</td>
<td>40.30%</td>
</tr>
<tr>
<td></td>
<td>70-79</td>
<td>10</td>
<td>2.40%</td>
</tr>
<tr>
<td>Employment</td>
<td>Full time employed</td>
<td>183</td>
<td>43.40%</td>
</tr>
<tr>
<td></td>
<td>Part time employed</td>
<td>46</td>
<td>10.90%</td>
</tr>
<tr>
<td></td>
<td>Out of Work (but looking for)</td>
<td>12</td>
<td>2.80%</td>
</tr>
<tr>
<td></td>
<td>Out of Work (but not looking for)</td>
<td>3</td>
<td>0.70%</td>
</tr>
<tr>
<td></td>
<td>Homemaker</td>
<td>39</td>
<td>9.20%</td>
</tr>
<tr>
<td></td>
<td>Student</td>
<td>7</td>
<td>1.70%</td>
</tr>
<tr>
<td></td>
<td>Retired</td>
<td>111</td>
<td>26.30%</td>
</tr>
<tr>
<td></td>
<td>Unable to Work</td>
<td>21</td>
<td>5%</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>Non-Hispanic White or Euro-American</td>
<td>352</td>
<td>83.40%</td>
</tr>
<tr>
<td></td>
<td>Black, Afro-Caribbean, or African American</td>
<td>32</td>
<td>7.60%</td>
</tr>
<tr>
<td></td>
<td>Latino or Hispanic American</td>
<td>19</td>
<td>4.50%</td>
</tr>
<tr>
<td></td>
<td>East Asian or Asian American</td>
<td>8</td>
<td>1.90%</td>
</tr>
<tr>
<td></td>
<td>South Asian or Indian American</td>
<td>4</td>
<td>0.90%</td>
</tr>
<tr>
<td></td>
<td>Native American or Alaskan Native</td>
<td>2</td>
<td>0.50%</td>
</tr>
<tr>
<td></td>
<td>Mixed</td>
<td>3</td>
<td>0.70%</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>2</td>
<td>0.50%</td>
</tr>
<tr>
<td>Education</td>
<td>Some high school or less</td>
<td>3</td>
<td>0.70%</td>
</tr>
<tr>
<td></td>
<td>High school graduate or equivalent</td>
<td>75</td>
<td>17.80%</td>
</tr>
<tr>
<td></td>
<td>Vocational/technical school (two-year</td>
<td>49</td>
<td>11.60%</td>
</tr>
<tr>
<td></td>
<td>program)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Some college, but no degree</td>
<td>100</td>
<td>23.70%</td>
</tr>
<tr>
<td></td>
<td>College graduate (four-year program)</td>
<td>113</td>
<td>26.80%</td>
</tr>
<tr>
<td></td>
<td>Some graduate school, but not degree</td>
<td>9</td>
<td>2.10%</td>
</tr>
<tr>
<td></td>
<td>Graduate degree (MSc, MBA, PhD, etc.)</td>
<td>67</td>
<td>15.90%</td>
</tr>
<tr>
<td></td>
<td>Professional degree (M.D., J.D., etc.)</td>
<td>6</td>
<td>1.40%</td>
</tr>
<tr>
<td>Geographical location</td>
<td>Urbanized Area (50,000 or more people)</td>
<td>175</td>
<td>41.50%</td>
</tr>
<tr>
<td></td>
<td>Urban Cluster (at least 2,500 and less</td>
<td>128</td>
<td>30.30%</td>
</tr>
<tr>
<td></td>
<td>than 50,000)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rural (all other areas)</td>
<td>119</td>
<td>28.20%</td>
</tr>
<tr>
<td>Household Income</td>
<td>$0-$24,999</td>
<td>58</td>
<td>13.70%</td>
</tr>
<tr>
<td></td>
<td>$25,000-$49,999</td>
<td>115</td>
<td>27.30%</td>
</tr>
<tr>
<td></td>
<td>$50,000-$74,999</td>
<td>110</td>
<td>26.10%</td>
</tr>
<tr>
<td></td>
<td>$75,000-$99,999</td>
<td>68</td>
<td>16.10%</td>
</tr>
<tr>
<td></td>
<td>More than $100,000</td>
<td>71</td>
<td>16.80%</td>
</tr>
<tr>
<td>Marital Status</td>
<td>Single (never married)</td>
<td>101</td>
<td>23.90%</td>
</tr>
</tbody>
</table>
4.2 Measurement items

The questionnaire encompassed 30 measurements (Table 2). Items were measured employing a seven-point Likert scale. Respondents had an opportunity to express their choice by selecting one of the seven options provided (strongly disagree; disagree; somewhat disagree; neither agree nor disagree; somewhat agree; agree; strongly agree). This approach is considered to be an effective way to measure latent variables (Churchill, 2002). Performance expectancy and effort expectancy are constructs taken from UTAUT (Venkatesh et al., 2003). Items to measure hedonic and utilitarian beliefs were adopted from the paper by Babin et al. (1994), whereas items to assess individuals’ subjective well-being were adopted from the study by (Diener et al., 2010). The scale used by Ajzen and Fishbein (1980), Taylor and Todd (1995b), Riemenschneider and McKinney (2002), Huang and Chuang (2007) was adopted to examine respondents’ smart home use behaviour. The satisfaction scale derived from the study by (Spreng and Mackoy, 1996). Finally, the scale created by Dodds et al. (1991) was employed to measure the perceived value of smart home technology use.

Table 2: Measurement Items

<table>
<thead>
<tr>
<th>Measurement Item</th>
<th>Loading</th>
<th>C.R.</th>
<th>AVE</th>
<th>Cronbach’s α</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Performance Expectancy</strong> (Venkatesh et al., 2003, Venkatesh and Morris, 2000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I would find smart technologies useful in my daily life</td>
<td>0.936</td>
<td></td>
<td>0.875</td>
<td>0.965</td>
</tr>
<tr>
<td>Using smart technologies enables me to accomplish tasks more quickly</td>
<td>0.958</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using smart technologies increases my productivity in the house</td>
<td>0.946</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If I use smart technologies, I increase my chances of achieving things that are important to me</td>
<td>0.901</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Effort Expectancy</strong> (Venkatesh et al., 2003, Venkatesh and Morris, 2000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My interaction with smart technologies is clear and understandable</td>
<td>0.888</td>
<td></td>
<td>0.867</td>
<td>0.962</td>
</tr>
<tr>
<td>It is easy for me to become skillful at using smart technologies</td>
<td>0.932</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I find smart technologies easy to use</td>
<td>0.95</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning to operate smart technologies is easy for me</td>
<td>0.954</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hedonic Beliefs</strong> (Babin et al., 1994)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compared to other things I could have done, the time I spend using smart technologies is truly enjoyable</td>
<td>0.933</td>
<td></td>
<td>0.879</td>
<td>0.973</td>
</tr>
<tr>
<td>I enjoy being immersed in exciting new smart products</td>
<td>0.946</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I enjoy the use of smart technologies for its own sake, not just for the services that they provide</td>
<td>0.921</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have a good time using smart technologies, because I am able to act on the “spur-of-the-moment“</td>
<td>0.946</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>During the use of smart technologies, I feel the excitement</td>
<td>0.942</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Utilitarian Beliefs</strong> (Babin et al., 1994)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I accomplish just what I want when using smart technologies</td>
<td>0.949</td>
<td></td>
<td>0.863</td>
<td>0.949</td>
</tr>
<tr>
<td>I can achieve what I really need when using smart technologies</td>
<td>0.951</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>When using smart technologies, I find just the services I am looking for</td>
<td>0.886</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Subjective Well Being</strong> (Diener et al., 2003, Diener et al., 2010)</td>
<td></td>
<td></td>
<td>0.82</td>
<td>0.965</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Married</th>
<th>252</th>
<th>59.70%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Separated</td>
<td>2</td>
<td>0.50%</td>
</tr>
<tr>
<td>Widowed</td>
<td>15</td>
<td>3.60%</td>
</tr>
<tr>
<td>Divorced</td>
<td>52</td>
<td>12.30%</td>
</tr>
</tbody>
</table>
The Effect of Behavioural Beliefs on Smart Home Technology Adoption

Using smart technology makes it possible to ... - lead a purposeful and meaningful life 0.873
Using smart technology makes it possible to ... - feel that my social relationships are supportive 0.915
Using smart technology makes it possible to ... - feel that I am engaged in my daily activities 0.943
Using smart technology makes it possible to ... - feel that I can contribute to the well-being of others 0.935
Using smart technology makes it possible to ... - feel that I am competent 0.876
Using smart technology makes it possible to ... - feel optimistic 0.89

Use Behaviour (Ajzen and Fishbein, 1980, Taylor and Todd, 1995a, Taylor and Todd, 1995b, Riemenschneider and McKinney, 2002, Huang and Chuang, 2007) 0.885 0.795 0.881
I could communicate to others the consequence of using smart technologies 0.837
The results of using smart technologies are apparent to me 0.943

Satisfaction (Spreng and Mackoy, 1996) 0.952 0.832 0.951
How satisfied are you with your overall experience with smart technology? 0.906
How much pleasure do you get from your overall experience with smart technology? 0.946
Given your overall experience with smart technologies, do you get frustrated or contented? 0.861
Given your overall experience with smart technologies, do you feel terrible or delighted by them? 0.934

Perceived Value (Dodds et al., 1991) 0.874 0.776 0.871
Smart technologies are considered to be a very good buy 0.922
Smart technologies appear to be a good bargain 0.838

Note: 7-point Likert scale was employed to measure the items: Model fit: $\chi^2(377) = 807.8$, CMIN/DF = 2.143, CFI = .976, RMSEA = .052

4.3 Data Analysis

Our data analysis strategy was based on the guidelines provided by (Hair Jr and Lukas, 2014) and by (Gaskin, 2016). To examine the proposed hypotheses, we used SPSS v.24 and SPSS AMOS v. 24 statistical software tools. The first step was to run confirmatory factor analysis to assess construct validity and reliability. CFA suggested a satisfactory model fit (table 2). The reliability of each measured variable was satisfactory (Hair Jr and Lukas, 2014), including the factor loading (>0.8), construct reliability (C.R. >0.8), average variance expected (AVE > 0.7) and Cronbach’s α (>0.8). Analysis showed no validity concerns (table 3).

Table 3: Convergent Validity


<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hedonic Beliefs</td>
<td>0.938</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance</td>
<td>0.862</td>
<td>0.935</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effort Expectancy</td>
<td>0.797</td>
<td>0.814</td>
<td>0.931</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utilitarian Beliefs</td>
<td>0.901</td>
<td>0.845</td>
<td>0.786</td>
<td>0.929</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Value</td>
<td>0.827</td>
<td>0.759</td>
<td>0.655</td>
<td>0.845</td>
<td>0.881</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satisfaction</td>
<td>0.786</td>
<td>0.742</td>
<td>0.718</td>
<td>0.808</td>
<td>0.79</td>
<td>0.912</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use Behaviour</td>
<td>0.76</td>
<td>0.734</td>
<td>0.784</td>
<td>0.79</td>
<td>0.694</td>
<td>0.732</td>
<td>0.892</td>
<td></td>
</tr>
<tr>
<td>Subjective Well being</td>
<td>0.793</td>
<td>0.729</td>
<td>0.59</td>
<td>0.74</td>
<td>0.766</td>
<td>0.745</td>
<td>0.602</td>
<td>0.906</td>
</tr>
</tbody>
</table>
5. Findings & Discussion

The proposed model was in line with the required model fit criteria (table 4). All hypotheses were supported except for H1. We analysed the effect of the antecedents examined, such as performance expectancy and effort expectancy on the effect on use behaviour. The IS literature, specifically in the area of technology acceptance and adoption, reported a positive effect of UTAUT constructs on technology use (Venkatesh et al., 2003, Wang et al., 2009, Teo, 2011). Our analysis revealed a weak effect of effort expectancy on use behaviour and performance expectancy was not statistically significant. Therefore H1 was not supported and H2 was partially supported. This result can be interpreted on the grounds that our sample consisted of individuals who had used smart home technology in the past (Mathieson, 1991, Im et al., 2011). Both hedonic and utilitarian beliefs were statistically significant at the < 0.001 level and had a medium to strong effect on individuals’ use behaviour. This finding supported our hypotheses H3a and H3b and it was consistent with the evidence in the literature that hedonic and utilitarian beliefs affect behaviour and purchase intention. The literature claims that the intention to consume a product is heavily contingent on the hedonic or utilitarian values that drive users towards accepting the technology (Van der Heijden, 2004, Babin et al., 1994).

The second focus of this study was to test relevant outcomes of smart home technology use. The analysis revealed that smart home use has a statistically significant and a strong effect on subjective well-being, satisfaction and perceived value. Accordingly, H4-H6 were supported with significance at the < 0.001 level. These strong relationships explain the benefits that smart home technologies are capable of realising (Balta-Ozkan et al., 2014, Balta-Ozkan et al., 2013a, Balta-Ozkan et al., 2013b, Marikyan et al., 2019). The statistically significant and strong effect of the use behaviour on subjective wellbeing is in line with the viewpoint of (Demir and Hensel, 2008). The aforementioned study stated that using smart home technologies might increase the overall wellbeing of the residents. However, the current study was the first to confirm this empirically. In addition to the viewpoint of Balta-Ozkan et al. (2013a) and Aldrich (2003), this study empirically confirmed that individuals gain satisfaction and perceived value, which can be interpreted in terms of the financial, environmental and health-related benefits that smart home technology use brings.

Table 4: The results of hypothesis testing: SEM (H1-7): Model Fit X2 (392) = 1082.725, CMIN/DF = 2.762, CFI = 0.961, RMSEA = 0.065

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Standardised Path Coefficient</th>
<th>t-values</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1: Performance Expectancy --&gt; Use Behaviour</td>
<td>0.095</td>
<td>1.731(ns)</td>
<td>0.909</td>
</tr>
<tr>
<td>H2: Effort Expectancy --&gt; Use Behaviour</td>
<td>0.111</td>
<td>2.504(2**)</td>
<td>0.909</td>
</tr>
<tr>
<td>H3a: Hedonic Beliefs --&gt; Use Behaviour</td>
<td>0.337</td>
<td>4.933(3***)</td>
<td>0.909</td>
</tr>
<tr>
<td>H3b: Utilitarian Beliefs --&gt; Use Behaviour</td>
<td>0.459</td>
<td>6.776(3***)</td>
<td>0.909</td>
</tr>
<tr>
<td>H4: Use Behaviour --&gt; Satisfaction</td>
<td>0.873</td>
<td>16.079(3***)</td>
<td>0.762</td>
</tr>
<tr>
<td>H5: Use Behaviour --&gt; Subjective Well Being</td>
<td>0.810</td>
<td>14.698(3***)</td>
<td>0.657</td>
</tr>
<tr>
<td>H6: Use Behaviour --&gt; Perceived Value</td>
<td>0.881</td>
<td>14.74(3***)</td>
<td>0.777</td>
</tr>
</tbody>
</table>
Conclusion and Future Research Avenues

There is a dearth of empirical studies that examine users’ perspectives on smart home technologies as a pervasive technology in private spaces (Chan et al., 2008, Marikyan et al., 2019). Given the identified gap, this study aimed to examine the factors influencing smart home use behaviour and outcomes of smart home technology use. First, this study contributes to the smart home literature and technology acceptance literature. The main contribution is in understanding the effect of smart home usage on people’s life. This study found that smart home usage has a statistically significant and strong effect on perceived value, subjective wellbeing and satisfaction. The second contribution was testing whether behavioural beliefs, such as hedonic and utilitarian beliefs, had a statistically significant effect on acceptance of pervasive technology in private space.

This study is not without limitations. First, smart home technology users were located in the United States. A study developed by Balta-Ozkan et al. (2013b) revealed that consumers’ perceptions of smart home technology differ in the United Kingdom, Germany and Italy. In addition, cultural differences and the advancement level of the information system infrastructure might affect individuals’ perception and acceptance of technology (Al-Gahtani et al., 2007, Straub et al., 1997, Sunny et al., 2018). Therefore it may be important to test the smart home use behaviour model by employing a sample from other countries. In addition, the proposed model can be extended by applying moderating effects, such as personality traits, to examine their effect on the relationship of the use behaviour and behavioural outcomes. Lastly, drawing upon the smart home literature (Martin et al., 2008, Chan et al., 2009, Marikyan et al., 2019) there is a need to identify factors that can hinder the acceptance of smart home technology.
Reference List


The Effect of Behavioural Beliefs on Smart Home Technology Adoption


The Effect of Behavioural Beliefs on Smart Home Technology Adoption

EXPLORING THE INFLUENCE OF SOCIAL MEDIA INFORMATION ON INTERPERSONAL TRUST IN VIRTUAL WORK PARTNERS

Abstract

This developmental paper aims to start an exploratory investigation regarding the impact of social media information on interpersonal trust in virtual work partners. The potential impact will be examined via the lens of three key social theories used for studying virtual teams in Information System (IS) research. An initial theoretical model is proposed at the end of the paper.

Keywords: Interpersonal trust, Social media, Virtual work

1.0 Introduction

Consider the following scenario in a typical workplace environment: individual A has a work partner – individual B – with whom interactions occur exclusively via Information and Communication Technology (ICT) tools. Since the two individuals have never met face to face, and because most of the communication between them in the workplace is task-related; individual A decides to review individual’s B profile in social media technologies – such as Facebook, LinkedIn, and Twitter – to know more about the work partner. Can the information individual A acquire via social media technologies impact his/her trust in individual B? If so, what elements explain the impact?

These are the main questions this early research paper aims to explore. In formal terms, the objective of this paper is to start an exploratory investigation regarding the impact of social media information on interpersonal trust in virtual work partners. According to Söllner et al. (2016), so far, most of the Information Systems (IS) research on trust relationships between people have been divided into clusters of studies that focus on trust i) within virtual teams, ii) buyer-seller-like relationships in e-commerce, and iii) among users of online social networks. The few reported studies that have tried to explore inter-effects between clusters i) and iii) in the workplace have either not been conclusive (Kuo and Thompson, 2014) or didn´t focus on trust as the ultimate goal (Cao et al., 2012). This paper suggests that IS researchers can be more successful in addressing this gap in trust research by using a comprehensive theoretical framework.
2.0 Theoretical background

This chapter explores the potential inter-effects between the concepts of interpersonal trust and social media technologies in the context of virtual workplace relationships.

2.1 Trust in virtual work partners

Trends like globalization coupled with advances of ICT tools in the last decades, have pushed companies to move away from a collaboration model based on human resources located within the same physical location and increasingly exposed their employees to collaborate via ICT with virtual partners without their visual proximity (Jarvenpaa et al., 1998; Kanawattanachai and Yoo, 2002; Schiller and Mandwivalla, 2007).

When two virtual work partners need to maintain a collaborative relationship, interpersonal trust between them is essential (Jarvenpaa et al., 1998; Kuo and Thompson, 2014). Interpersonal trust is defined by McAllister (1995) as “the extent to which a person is confident in, and willing to act on the basis of, the words, actions, and decisions of another” (p. 25). Therefore, in a dyadic relationship trust involves two specific parties: a trusting party (trustor) and a party to be trusted (trustee).

Interpersonal trust on the trustor side typically develops via a combination of two processes: constructive interactions with the trustee and assessment of trustee’s interpersonal cues that indicate trustworthiness. Whereas the first process tends to contribute to the affective foundations of interpersonal trust, the latter supports its cognitive foundations. Therefore, interpersonal trust is frequently approached as a multidimensional concept (Bente et al., 2008; Gefen and Straub, 2004; Kanawattanachai and Yoo, 2002; McAllister, 1995).

Though important, interpersonal trust between virtual work partners can be difficult to establish given the constrained context of a virtual relationship. Elements that facilitate trust building during face-to-face interactions, such as social dialogs and opportunities to monitor each other’s behaviour, may not be present for virtual work partners (Jarvenpaa et al., 1998; Kanawattanachai and Yoo, 2002; Kuo and Thompson, 2014).

Given that social bonds and availability of cues about the trustee tend to be scarce in a virtual workplace environment, social media seems to be an interesting source of additional information for trustors to interact with and assess trustees’ characteristics (Kuo and Thompson, 2014).
2.2 The effect of social media technologies

Social media technologies can be conceptualized as an IS artefact consisting of three components: the technological, supporting social interactions; the informational, consisting of user generated digital content; and the social, involving communication and collaboration among people (Spagnoletti et al., 2015; Wakefield and Wakefield, 2016). Popular examples of social media technologies are Facebook, LinkedIn, and Twitter (Jahng and Littau, 2016; Kuo and Thompson, 2014; Wakefield and Wakefield, 2016).

Social media technologies provide individuals with the possibility to exchange information in various forms, comprising not only the user generated digital content (Lim and Van der Heide, 2014; Spagnoletti et al., 2015), but also the perception of the social interaction (Jahng and Littau, 2016; Wakefield and Wakefield, 2016); which can potentially influence interpersonal trust for real life relationships (Kuo and Thompson, 2014).

This potential influence can be explored via three social theories commonly used for virtual team research in the IS domain (Schiller and Mandwivalla, 2007): social presence theory, social information processing theory, and social identity or deindividuation theory.

First, social presence theory (SPT) (Short et al., 1976; Schiller and Mandwivalla, 2007) suggests that the awareness of others social participants’ interactions (i.e., social presence) can be augmented in communication via ICT tools as more channels become available for the nonverbal cues. A high degree of social presence is important for the development of trust since the trustor’s perception of human interactions with the trustee is a precondition for trust (Vries, 2006), especially its affective dimension (Bente et al., 2008; Gefen and Straub, 2004; McAllister, 1995). Despite the limited presence of actual human contact in virtual workplace environments, previous research has suggested that social presence can be embedded in technology artefacts, such as websites, via images and biographical information that convey sense of personal, sociable and sensitive human contact (Bente et al., 2008; Gefen and Straub, 2004; Jahng and Littau, 2016; Vries, 2006). This is in line with the informational component of social media technologies whose focus is on user-created content, such as personal profiles, text, photographs, and video streams (Spagnoletti et al., 2015; Wakefield and Wakefield, 2016).
Second, social information processing theory (SIPT) (Walther, 1992; Schiller and Mandwivalla, 2007) proposes that when communicating solely via ICT tools in which nonverbal cues are not available, individuals adapt and use available information to form impressions and evaluate others. SIPT suggests that, in virtual environments where nonverbal communication cues are often not available, people tend to rely on peripheral social information, such as language, written attitude, and self-disclosure to form impressions about others (Lim and Van der Heide, 2014; Jahng and Littau, 2016; Walther, 1992). In that sense, social media technologies provide users with generous opportunities to disclose information about other individuals (Spagnoletti et al. 2015; Wakefield and Wakefield, 2016). The way these additional cues can affect interpersonal trust will depend if they make salient aspects of personal identity or social identity (Tanis and Postmes, 2005).

Regarding personal identity, previous research has suggested that even relatively minimal information, such as an individual’s profile information in social media can function as a set of cues to better evaluate professional credentials (Lim and Van der Heide, 2014; Jahng and Littau, 2016), which in turn can help foster cognition-based component of trust (Bente et al., 2008; Kanawattanachai and Yoo, 2002; McAllister, 1995).

As for social identity, according to social identity or deindividuation (SIDE) theory (Spears and Lea, 1992; Schiller and Mandwivalla, 2007), in environments where individuating cues about others are limited, individuals categorize themselves as part of social groups based on the information available by other sources. Therefore, in virtual environments, when trustee’s cues to shared social identity with the trustor are available, such as common interests, experiences, values, and demographic traits; they may accentuate the perception of similarity to a social group and enhance trustor’s feelings of attraction and identification toward the trustee (Tanis and Postmes, 2005; Vries, 2006). These are elements that can help foster both affective and cognition-based components of trust (McAllister, 1995; Kanawattanachai and Yoo, 2002; Lu et al., 2010).

The proposed relationships described above are illustrated in Figure 1.
3.0 Concluding remarks and next steps

This early research paper aims to start an exploratory investigation regarding the impact of social media information on interpersonal trust in virtual work partners. By considering a wider theoretical framework in comparison to previous studies, an initial set of relationships was proposed.

As next steps on this research, the theoretical model needs to be empirically validated. Given the exploratory nature of the model, the current plan is to conduct a survey among professionals and evaluate results via second-generation multivariate techniques, such as Structural Equation Modelling. First, moderating and control variables need to be determined and proper operationalization of all concepts in the model need to be established.

References


STRATEGIC ALIGNMENT: TOWARDS A HOLISTIC PERSPECTIVE EMBRACING COMPLEXITY – ADVANCING THE RESEARCH AGENDA

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Topic: Strategic Alignment
Domain: Strategic Information Systems
Abstract:

Strategic alignment has been extensively researched and reviewed. However, the field seems to have reached a stagnant stage in regard to the theoretical, methodological and philosophical foundations employed. In addition, existing research has been criticised due to its inability to capture the messy reality of organisations as well as it being undesirable for firms – as organisations must always change. This paper offers a review of the critique and address them in a constructive manner that reveals the underlying assumptions of which the criticisms are derived. In doing so, new perspective is offered that draws on concepts of complexity theory such as emergence and co-evolution. Special issues have proposed embracing complexity – but the publications to date do not reflect this. Therefore the aim is to offer a stepping stone for further research that builds on the foundation and insights provided by previous alignment research.

Key Words: Strategic Alignment, Emergence, Co-Evolution, Process, Complexity

1.0 Introduction:

Strategic alignment (SA) has been a core part of the strategic information systems research stream (Gable, 2010). It is thoroughly reviewed and discussed (see Chan & Reich, 2007a, 2007b; Coltman et al., 2015), perhaps due to the fact that it has remained a top management concern for the last three decades (Kappelman et al., 2018). Scholars engaging in the inquiry of SA have drawn on information systems research, strategic management and organisation theory. While these three domains have continued to advance in terms of theoretical underpinnings and methodologically tools – the SA literature has not followed the suit. Due to the stagnant stage of SA (in regards to new perspectives), it has received criticisms – as presented by Chan & Reich (2007a). Much of this criticism stems from the of the researchers sticking to ‘classical’ or ‘traditional’ theoretical frameworks and methodologies that have not allowed this topic to be advanced at the same pace as other topics in SA’s neighbouring domains.

These traditional, contingency-based approaches are reflective of reductionism. The reductionist methodology seeks to reduce (break) the organisational system into smaller parts and use contingency-based analytical frameworks to construct a theory to understand how these smaller parts function (Sayer, 1992; Pollalis, 2003; Burgelman, 2011). As Rashidiard & Colleagues (2015) note in regard to strategic management: the predominant reductionist approach led to inconsistencies in findings regarding strategy constructs and performance
which may not be appropriate to capture a firm’s reality. Reductionist approach is rooted in the positivist paradigm which disregards stratification, emergent powers (Sayer, 1992) and other complexities of social reality (Sachs & Ruhli, 2001). To counter these issues – scholars have proposed a holistic approach which captures reality in flight, identifies complex interrelationships and acknowledges emergent processes such as improvisation by adopting complex systems concepts and perspectives such as co-evolution (Weick, 1998; Lewin & Volberda, 1999; Kogetsidis, 2012) or a configurational approach (Rashidiard et al., 2015).

As physics Nobel Laureate Laughlin (2006) claims, we are now at the ‘emergent age’ which replaces the reductionist approach that gave rise to positivism. This era refers to emergentism which “looks for the underlying mechanisms under which these phenomena come about” (Lai, 2007: 570). Although the natural sciences were first to embrace the concepts of complexity after realisation that systems are not stable, certain and composed of linear relationships – but rather characterised by instability, uncertainty and non-linear processes (Prigonene, 1997), social scientist, management scholars and IS researchers have realised the usefulness of embracing complexity in attempting to construct holistic approaches to understanding, researching and examining organisational phenomena (Lewin & Volberda, 1999; Merali, 2006; Merali & McKelvey, 2006; Jaccuci et al., 2006; Merali & Allen, 2011; Thietart & Forgues, 2011; Merali et al., 2012; Condorelli, 2016).

Therefore, the aim of this paper is to address these criticisms in a constructive manner and to continue the proposals set out by special issues on embracing complexity in the information systems field (see Jaccuci et al., 2006; Merali & McKelvey, 2006). First, the criticisms are stated, examined and discussed. This will give the reader an understanding of the context as well as promoting the need for processual research. Secondly, complex adaptive systems, emergence and co-evolution will be discussed as a possible future avenue to advance SA research. Finally, a discussion is provided to suggest future possible research topics and questions to further the agenda put forward in the special issues.

2.0 Criticisms:

The following section will address the four major criticisms noted by Chan & Reich (2007a: 298) by providing a counterargument. The criticism arise from scholars who argue that SA literature has so far failed to effectively capture the phenomenon and claiming that SA in itself being not being desirable. Thus the question is – should we abandon the quest to further examine SA? The short answer is – No. The long answer is that Chief Information Officers
have ranked it a top priority for the last three decades (Kappelman, 2018), suggesting that research should still make an attempt to understand this phenomenon in a holistic manner. This can be achieved by taken an alternative perspective; namely one that overcomes the criticisms and allows for a new perspective on the phenomenon that has the ability to capture real organisational dynamics and offers practical insights to the practitioners.

2.1 Criticism #1: Alignment research is mechanistic and fails to capture real life

The first argument against SA presents mechanistic approach adopted by previous research – emphasising the use of static variance-based scientific method where researchers employed models to test various relationships for significance and attempted to understand human interaction (Chan & Reich, 2007).

As Ciborra (1997: 71) notes in a commentary on SA, the world is messy and that ‘sophisticated’ models developed on SA “remain a de-worlded image of the organisation”. This statement refers to the use of static methodological approaches that are not able to capture the characteristics of a ‘messy’ world. For example, some authors report that SA does not remain constant due to ‘muddling through’ and tinkering’ (Vitale et al., 1986) or that the use of technology is characterised by improvisations and ‘bricolage’ (Orlikowski, 1996; Ciborra, 1998). Thus, in order to capture the reality of organisations one must incorporate the ontological concept of ‘becoming’ to understand improvisation, emergence and micro practices that enact order within the firm (Weick, 1998). Although this point-of-view has already been incorporated by processual strategy researchers such as Mintzberg and Burgelman as well as by process theorists such as Pettigrew, Dawson and Van de Ven – these have not been translated to the approach taken by SA researchers specifically and IS in general to the extent as in the neighbouring domains; and hence, the research is too mechanistic and fails to capture real life.

The second issue is the use of contingency theory which led to previous research being reductionist. Alignment in the general management arena was derived from both contingency theory and population ecology – which paved the way to understand the contingency variables that influence performance and firm survival. Within the contingency tradition, the presented models all have the underlying assumption that context (internal or external) and structure must fit to achieve and maintain performance (Drazin & Van de Ven, 1985). Following this, contemporary fit-based research has sought to understand and measure the alignment between various constructs to determine the influence on performance. Common contingencies used in
SA literature include: firm size (Ein-Dor & Segev, 1982; Raymond et al., 1995; Chan et al., 2006), industry (Tan, 1995; Chan et al., 2006); strategic orientation (Tan, 1995; Croteau & Bergeron, 2001; Chan et al., 2006; Tallon 2008, 2011), and environmental uncertainty (Choe, 2003; Yayla & Hu, 2009). These studies are reminiscent of the linkage-exploring domain of strategy research, that attempt to understand the link between contingencies, firm performance and alignment (Hutzschenreuter & Kleindienst, 2006). These studies are also reflective of the reductionist era, by breaking down the system into smaller parts to understand their ‘links’.

Contingency-based studies have been criticised in the management field in general (e.g. Schoonhoven, 1981; Drazin & Van de Ven, 1985; Fry & Smith, 1987) as well as in IS and SA literature specifically (Weill & Olson, 1989; Brown & Magill, 1994; Sambamurthy & Zmud, 1999). The first issue relates to the lack of clarity in theoretical assumptions that are used to guide contingency research. Schoonhoven (1981: 351) notes that the assumptions such as – this structure fits this specific environment – is too ‘ambiguous’ and requires more precision; suggesting that “it is quite possible that environment and technology are related to distinctly different structural variables rather than to the same unspecified set”. In that manner, contingency theorists also tend to misinterpret alignment to be contingency effects rather than merely congruent relationships – thus attempting to ‘mix apples and oranges’ to understand and predict organisation phenomena (Drazin & Van de Ven, 1985; Fry & Smith, 1987).

The mixing apples and oranges refers to using different conceptualisations of SA with different analytical methods to understand the relationship of SA with firm performance. In that sense, it is close to impossible to combine findings to produce a coherent and generalisable framework of contingency variables. Venkatraman (1989) developed an overview of six types of alignment approaches – each with distinct theoretical meanings and analytical methods – that have been used in strategic management literature. Due to differing approaches, differing and contradicting results have occurred. Bergeron & Colleagues (2001 : 139) tested each six types of alignment as proposed by Venkatraman in the IS field and found that different measures of alignment lead to different results regarding the achievement of abnormal returns. Furthermore, they concluded that the inability of research to “specify the exact perspective of fit… often lead researchers to obtain contradictory, mixed, or inconsistent results”. Additionally, while Parthasartathy & Sethi (1993), Chan & Colleagues (1997) and Li & Ye (1999) found significant relationship between SA and firm performance using the moderation approach (criterion specific), Kearns & Lederer (2000) found a non-significant relationship using the criterion-free matching perspective (Oh & Pinsonneuault, 2007). Venkatraman acknowledges the limitations
of the various alignment approaches during longitudinal operationalisations of fit and states that alignment “is a dynamic and never-ending task, whereby the organisation is continually “shooting at a moving target of coalignment (Thompson, 1967: 234)... [and] it is unclear whether the six perspectives identified here are appropriate for testing them” (Venkatraman, 1989: 441).

The aforementioned contradictions have been known to refer to as the alignment paradox (see Gerow et al., 2014; Liang et al., 2017; Zhou et al., 2018). Interestingly, the plethora of contradictions is not unique to the SA literature, but common among all domains that employ contingency theory as a result of a reductionist approach. Edwards (1994: 51) identifies the same issue in the organisation behaviour field – stating that the use of contingency theory “present numerous substantive and methodological problems that severely threaten the interpretability and conclusiveness of the obtained results”.

Weill & Olson (1989: 59) also present a critique of contingency theory, concluding that “research in MIS has been hampered by the use of a naïve meta-theory, conflicting empirical results with low explained variance, ill-defined concepts of performance and fit, and a narrow perspective of researchers”. They suggest specific recommendations to overcome the narrow focus and naïve meta-theory derived from contingency theory. The recommendations revolve around employing a different set of methodologies, such as qualitative case studies, ethnographic studies, longitudinal studies, and a mixed-method methodology to support theory building in the MIS research domain (Weill & Olson, 1989). Indeed, the majority of SA and IS research in general have adopted a positivist epistemological perspective (Orlikowski & Baroudi, 1991; Chen & Hirschheim, 2004) in contrast to interpretivism and the more recent critical realist approach (Wynn & Williams, 2012; Mingers et al., 2013). The positivist approach has led to numerous assumptions being adopted from the natural sciences where scholars “are in effect attempting to freeze the social world into structured immobility and to reduce the role of human beings to elements subject to the influence of a more or less deterministic set of forces” (Morgan & Smircich, 1980: 498). Thus, it may be beneficial to adopt a new lens with differing ontological and epistemological assumptions.

2.1.1: Summary

The message is clear. The current methodological toolset does not allow to capture the social reality nor to understand the complex processes at play. Secondly, the research is confronted with contradictory and mixed results – which is less beneficial to the practitioner. The general
consensus is that alignment leads to better performance and efficiency. Therefore, continuing the investigation of construct-performance linkages using differing analytical approaches to understand alignment and performance advances the field to a lesser extent. Rather, practitioners and researchers are may be better served by investigating how alignment is achieved and how it evolves in an organisation. In order to do so, scholars in the aforementioned sections argue for the use and adoption of qualitative methods and a processual ontology. This research approach allows for a holistic understanding that acknowledges the emergent nature of processes and the dynamic context in which SA is achieved.

2.2 Criticism #2: Alignment is not possible if the business strategy is unknown or in progress

The second argument is based on the premise that alignment of the IS strategy cannot occur if the business strategy is unknown or in progress (Chan & Reich, 2007a). The argument is also reminisce of an older debate within organisation theory that is representative of divergence in research that adopts either a voluntarist or deterministic approach to organisational adaptation and strategic change (Astley & Van de Ven, 1983; Hrebinia & Joyce, 1985). These schools directly relate to the assumptions on how strategy and change can be characterised. While some adopt the approach that strategy and change is planned (Voluntarist: e.g. Child, 1972; Quinn, 1980) others state that strategic change emerges naturally from the responses of the environment (Determinist: e.g. Weick & Quinn, 1999). Although some authors adopt these approaches as competing perspectives, Burnes (2004, 2012) as well as Bamford & Forrestor (2003) asserts that these approaches are complementary – representative of the dynamics of complex adaptive systems (Allen et al., 2011). Therefore, it is possible that this criticism arose of the use of a voluntarist approach, to the extent that strategy is only identified within plans and doesn’t consider the emergent forces at play in the strategising process. If there are no plans, actors still tend to take actions towards a goal – characterised by a more dominant emergent approach (Mintzberg, 2007). Within SA literature, Sabherwal & Colleagues (2001) acknowledge the treatment of alignment as a static end-state and make the case for needing to view alignment as ‘a moving target’ (Javenpenaa & Ives, 1993) and as an emergent process. Furthermore, in a recent study on the influence of entrepreneurial action on SA in new ventures, Street & Colleagues (2018) a more dominant emergent aligning activities in one case study. In that sense, there seems to be some evidence for the emergent nature of alignment, but it is not yet examined in-depth – in the form of understanding and tracing the emergent strategy overtime and its influence on the SA process.
SA research typically focused on intended strategy and not taking into account the emergent nature of strategy processes. The intended strategy never becomes realised but rather there are emergent actions, events and decisions that influence and alter the intended strategy. The key is to distinguish between alignment in terms of strategic plans (what firms intend to do) and alignment in terms of realised strategy – what firms actually do (Coltman et al., 2015). As Moncrieff (1999: 273) notes: “not all intended strategies are realised, and not all realised strategies were intended. Realised strategy is often emergent in nature”. This is supported by Mintzberg & Water (1985) who argue that strategy cannot be pure deliberate nor pure emergent, but rather in-between the continuum. To understand the complex organisation process of strategy, one must study the interplay between intended and realised strategies (Mintzberg, 1978), which is also suggested by IS Scholars (Chan et al., 1998). This will require “examining the existing documentation (IS strategy statements, documents, minutes of planning meetings, etc.), coupled with asking questions of key informants regarding the organization’s formal IS directions and strategic intent” (Chan et al., 1998: 274).

Finally, they state that “very little research has examined realised IS strategy. Also, very little research has addressed the measurement of either intended or realised IS strategy” (Chan et al., 1998: 274). The issue here is that previous SA content researchers have commonly analysed the ‘intended’ IS and business plans and strategies (e.g. Earl, 1989; Keen, 1991; Raghuanthan & King, 1988; Ward et al., 1990), although Mintzberg & Water’s (1985) make a clear and solid case that no strategy is realised as intended. In that regard, SA researcher must examine how the unintended, autonomous and emergent strategy shapes and shifts the final realised SA configuration – which has not yet been examined.

2.2.1: Summary

Overall, to advance the field of SA – both intended/deliberate and autonomous/emergent strategies must be traced over time to understand how the realised state of SA comes about. In doing so, the conceptualisation of strategy must be altered to incorporate its dynamic and emergent nature. Since much evidence suggests that strategy formation is not static and “rarely conforms to the ideal of rational decision-making an subsequent planned change”, it is better to view strategy formation as a process of change (Mintzberg et al., 1990; Chia 1994; Langley et al, 1995; Laroche, 1995; Hendrey 2000; cited in Sminia, 2009: 98).

To exemplify the aforementioned statement regarding planned change, top management may not even be aware of strategic change occurring (Burgelman, 1996) due to autonomous strategy
processes at the lower level of the organisation (Burgelman, 1983). Therefore, if researchers get top management to fill out surveys or questionnaires or even interview them – they will not be able to identify the emergent bottom-up change that is occurring. In that case the conceptualisation of strategy must be altered to include one that can – such as strategy as pattern (see Mintzberg & McHugh, 1985).

To develop a tool for identifying strategising actions and events that are deliberate and ones that are emergent, Burgelman’s (1991, 1994, 2002) framework for interorganisational ecology of strategy making and organisational adaptation can be utilised. Burgelman (1991, 2002: 347) conceptualises induced (deliberate) strategy as one that “exploits initiatives that are within the scope of a company’s current strategy” and autonomous (emergent) strategy as one that “exploits initiatives that emerge through exploration outside of the scope of the current strategy”. Using these conceptualisations may allow one to trace both emergent and deliberate strategic alignment processes over time and see how the final strategy is realised. These findings and explanations can assist the practitioner in understanding how to manage these emergent autonomous processes that can positively or negatively influence the final realised strategy.

2.3 Criticism #3: Alignment is not desirable as an end in itself since the business must always change

The third major criticism of SA contains two components: 1) that traditional research has classified SA as an ‘end-state’; and 2) that alignment creates inertia. Initially, SA was characterised as an outcome or end state – something to be achieved (e.g. Lederer & Salmela, 1996; Mentzas, 1997; Grover & Segars, 2005; Newkirk et al., 2008). However, scholars now argue that SA is not an end state, but rather a continuous process of adaptation and change (Henderson & Venkatraman, 1993), ‘a moving target’ (Jarvenpeena & Ives, 1993; Sabherwal et al., 2001) or a continuous balancing act (Burn, 1993, 1996). The second component, path dependence, refers to long-term alignment when a trajectory eventually leads to a ‘lock-in’ that produces inertia (Sydow et al., 2009). However, this criticism doesn’t take into account re-alignment. It would be counterproductive to disregard alignment purely on the fact that it leads to inertia, as any IS routine, activity or strategy carried out over a long period produces inertia – whether structural, political or psychological (see Besson & Rowe, 2012). Rather, the concept of re-alignment needs to be embedded within SA literature (as done with Sabherwal et al., 2001) to understand how firms have managed re-alignment efforts and to avoid undesired trajectories.
Inertia is a function of alignment (Hannan et al., 2002; Schwarz, 2012) – and therefore should be integrated within SA literature. The implication of fit within an open-systems perspective is that maintaining a long-term ‘steady-state’ leads to inertia through path dependence. However, positivist quantitative methodologies are not able to effectively analyse inertia and trace the trajectory of the path that leads to a ‘lock-in’. In terms of complexity-based concepts, when a strategy gets initiated (to fit with internal structures/components or with the environmental context), actors within the organisation will commence the implementation phase which produces a trajectory through self-reinforcing mechanisms (Sydow et al., 2009) – via recursive positive feedback loops. This suggests that the set path is difficult to reverse (and shouldn’t be reversed as ‘fit’ leads to greater performance) – due to resistance. The path then leads to a ‘lock-in’, which results in inertia – the inability for the firm or subsystem to realign without a major trigger, such as revolutionary change (as illustrated in the punctuated equilibrium model; Sabherwal et al., 2001). Thus, short-term fit is beneficial for performance while long-term fit is negatively associated with firm performance.

To avoid or overcome the current trajectory of a ‘lock in’, strategic renewal is required; which is defined as “the activities a firm undertakes to alter its path dependence” (Volberda et al., 2001: 160). Strategic renewal takes place in the form of autonomous and induced strategy processes. The autonomous strategy processes refer to lower level change agents who initiate actions outside the defined scope of upper management. Contrarily, induced strategy process emphasises management top-down action to drive renewal initiatives that are defined within the scope of the company’s overarching strategy (Burgelman, 1983). Both induced and autonomous processes regarding strategic renewal (altering path dependence) should be examined in the SA context – in an attempt to understand and help resolve the autonomous vs induced tension in strategic renewal literature (Schmitt et al., 2016).

2.3.1: Summary

Overall, the majority of SA research has viewed alignment as static. Due to this reason, inertia was never a concern to be addressed using variance studies. In contrast, the aim of the processual school in SA is to understand how inertia occurs (Chan & Reich, 2007a). Knowing how it occurs, the practitioners can use techniques to alter the path dependence that may lead to a failed IS strategy implementation that is not aligned with the business or corporate strategy. The first SA paper to examine the concept of inertia was Hirschheim & Sabherwal (2001) who identified three SA profiles based on the Miles and Snow (1978) typology. The authors offer a framework that organisations can adopt in their strategic IS realignment efforts. Chan & Reich
(2007b: 344) state that the key lesson to be learnt from the authors’ three-firm case study “is that it is important for organisations to understand the dynamic and emergent nature of business-information systems alignment”. Therefore, one can argue that inertia does exist and can offer efforts for realignment and that practitioners in organisations may find it useful in identifying these trajectories. Furthermore, inertia can constrain organisations since they generally want to maintain their status quo – thus it can comprise the development of innovation strategies (Chen et al., 2010). In that sense, a processual lens can be used to identify and trace bottom-up emergent strategies that arise outside of the scope of the predefined plan that will influence the final realised strategy. Finally, in a recent variance-based study, Liang & Colleagues (2017) found that social alignment moderates the relationship between intellectual alignment and inertia. This means that social alignment has the ability to prevent intellectual alignment from producing inertia via path dependence. Therefore, inertia provides a promising avenue for investigation.

2.4 Criticism #4: IT should often challenge the business, not follow it.

This criticism is derived from the fact that much of previous IS literature – and SA’s theoretical precursors – have viewed IS as a support tool for the organisation. As Peppard (2018) notes, the concept of an IS organisation has changed over the last 60 years in terms of name, role, function and position in an organisation. Initially, strategic alignment was conceptualised as the alignment of business and IS planning (e.g. King, 1978; Ein-Dor & Segev, 1978) where management viewed IS as mainly a support role. Afterwards, management realised the strategic potential of planning alignment and integrated IS into a firms structure to support corporate objectives (e.g. Pyburn, 1983; Henderson & Sifonis, 1988). However, now scholars view SA as a two-way relationship, defining SA as “the degree to which the IT mission, objectives, and plan support and are supported by the business mission, objectives, and plans” (Reich & Benbasat, 1996: 56). This view gives way to the idea of reciprocal alignment (Reich & Benbasat, 2000; Hirschheim & Sabherwal, 2001) which overcomes the view that IT is purely a support tool. To develop this further, Peppard & Ward (2016) present numerous studies arguing that SA should be viewed as a co-evolutionary process where business and IS strategies evolve and mutually influence each other. Although a conceptual paper was offered (see Benbya & McKelvey, 2006) – no empirical study has empirically demonstrated SA as a co-evolutionary process.
2.4.1: Summary

As noted in the preceding section, strategic alignment is a two-way relationship with the business and IS strategy. This means that SA should be conceptualised as a co-evolutionary process in that both strategies get formulated together (thus IT having equal chance to influence business) and that both vulnerable to changes from bottom-up emergent strategising by agents at the individual-level. Thus, in general, this criticism is derived from the ‘old’ conceptualisation of SA at the point when management viewed IT purely as a support role. However, as evidence shows, IS significantly influences the business strategy – thus the criticism is actually unfounded.

2.5 Conclusion:

Overall, the addressment of issues identifies the need to move away from the traditional theoretical perspectives and methodological approaches – similar to what is happening in other fields within both the natural and social sciences. As noted, the organisation – and the world in general – is messy. To capture and obtain a good understanding of how the organisation is enacting strategies and activities, a change in theoretical and methodological approaches is required. The new theoretical underpinnings can be related to concepts of complex adaptive systems: namely, emergence and co-evolution. Strategy is not purely intended and deliberate but rather influenced by emergent processes and alter the final realised strategy. Additionally, authors in the processual area have also called for the incorporation of co-evolution to contextualise strategising. Co-evolution can offer insights into how micro-level processes and activities form and develop, that eventually lead to macro-level outcomes (Koume & Langley, 2018).

To incorporate the new theoretical approaches, a ‘modern’ methodological toolset is required. Whereas previous SA literature has utilised statistical and mathematical models to understand contingencies and other linkages between SA and performance in a reductionist manner, qualitative methods can allow one to “study social systems characterised by complexity and nonlinear causation” (Burgelman, 2011: 591). To utilise qualitative methods such as longitudinal case studies to explore the SA phenomenon, an alternative epistemological standpoint needs to be taken. In the field of IS, the critical realist approach has been starting to gain momentum – evident by the special issue in MIS Quarterly (see Mingers et al., 2013). Critical realism (CR) is best suited for SA research as: 1) it is a “practice-based research domain encompassing aspects of both natural science and social science” (Zachariadis et al., 2013: 856); 2) SA is a co-evolutionary process occurring within a complex adaptive system which is
supported by the CR view of reality as complex systems where multiple differing mechanisms and conditions exist (Benbya & McKelvey, 2006; Zachariadis et al., 2013); 3) that using a single research perspective (i.e. positivist) for understanding IS phenomena is unnecessarily restrictive (Orlikowski & Baroudi, 1991; Mingers, 2001).

3.0 Complex Adaptive Systems, Emergence & Co-evolution

In general, complexity paradigm has been proposed in two special issues to advance the field of information systems (Jaccuci et al., 2006; Merali & McKelvey, 2006) and within organisation science (Anderson et al., 1999; Tsoukas & Dooley, 2011). The aim of all three issues was to stimulate dialogue and present new ways of theorising by using complex adaptive systems as a new tool to simplify complexity of organisations and their environment. Although these issues attempted to ‘nudge’ the researcher in incorporating these concepts to further the field, the publications since have not presented these initiatives (see Coltman et al., 2015). In addition, Merali (2006: 216) notes that the use of complexity science has stalled due to conflicting views regarding the application of complexity concepts in field of management as well as “fundamental principles being inappropriately applied to organisations”. Therefore, the aim of this paper is to convey how CAS concepts may prove useful in further developing and investigating SA – to overcome the hurdles and criticisms of previous research.

The focus of complex adaptive systems “is not to search for simple causes to complex outcomes but, rather, to understand how simplicity emerges from complex interactions” (Gell-Mann, 1994; in Thietart & Forgues, 2011: 56). Furthermore, McKelvey (1997) argues that these interactions within CAS should be observed through a co-evolutionary lens since these interactions do not occur in isolations, but rather influence each other through non-linear dynamics. Therefore, this section explores emergent (as it relates to emergent strategies as described by Mintzberg), co-evolution (to understand the dynamic relationship between business and IS strategies as well as micro-macro interactions). Additionally, processual sensemaking strategies are discussed as a way to study these phenomena.

3.1 Emergence

Emergence has been discussed in organisation change and strategic management literature. What both these streams have in common is that change and strategies emergence from the bottom up. In the context of CAS, emergence refers to “the phenomenon whereby the macroscopic properties of the system arise from the microscopic properties (interactions, relationships, structures and behaviours) and heterogeneity of its constituents” (Merali, 2006: 216).
To understand emergence as defined by Merali, the CR perspective is useful as it seeks to understand mechanisms on an ontological basis. The domain of real is comprised of mechanisms and structures, structures referring to ‘real entities’ that are the subject of investigation – commonly a company. These structures can also contain components (e.g. departments) or be part of a larger structure (e.g. industries). Mechanisms are defined as “causal structures that generate observable events”; particularly of interest are micro-macro mechanisms due to their explanatory value that can explain emergent behaviour where micro actions (interactions between varying components) can produce outcomes at the macro level (Henfridsson & Bygstad, 2013: 911). These ‘outcomes’ are events enacted from one or more mechanisms where observable events are ‘experiences’ that can be empirically observed (Wynn & Williamson, 2012).

The planned approach views “change as a process that moves from one ‘fixed state’ to another through a series of pre-planned steps” (Bamford & Forrester, 2003: 547). However, an organisation is not ‘frozen’ but is a ‘fluid entity’ where change is ‘ubiquitous and multidirectional’ (Kanter et al., 1992). Thus, we shall look at emergent change with is based on the “assumption that change is not a linear process or a one-off isolated event, but a continuous, open-ended, cumulative and unpredictable process of aligning and re-aligning an organisation to its changing environment” (Burnes, 2014: 363). These key facets are of interest to scholars in organisational studies. For example, Goldstein (2011: 66) notes that “emergence has surfaced as an important construct” that offers and suggests an alternative explanation to how structures, strategies and practices arise without being imposed from command/control hierarchies”. This notion should be of interest to practitioners, as it may explain why previous attempts at designing architectures to implement strategic alignment have not been successful – as IS failure is a prominent issue in both industry and scholarly research.

Regarding what could be advanced, two recent articles address emergent aligning actions in SA literature (see Karpovsky & Galliers, 2015; Street et al., 2018). Karpovsky & Galliers (2015) analyse extant SA literature using a strategy-as-practice lens to classify aligning activities and offer an analytical framework that identifies intended and emergent aligning activities with a focus on tools or agents. Additionally, Street et al. (2018: 74) support the classification presented by the previous authors and find that one case firm displayed emerging aligning activities “with its bricolage-style, evolved, unplanned, sense-and-respond approach to growth and development”. Although these studies advance the SA field by conceptualising SA as dynamic using a strategy-as-practice lens, a processual approach has yet to be developed.
that understands how alignment emerges rather than what activities actors engage in that results in emergent.

3.2 Co-Evolution:

As a way forward, SA scholars note that SA research should adopt a co-evolutionary perspective (Agarwal & Sambamurthy, 2002; Benbya & McKelvey, 2006; Tanriverdi et al., 2010; Vessey & Ward, 2013; Peppard & Ward, 2016). As the opening article to the newly founded MIS Quarterly Executive, Agarwal & Sambamurthy’s (2002) study reveals that ‘leading-edge’ firm encourage co-evolution of IT and the business. In that case, it is also of interest to scholars to understand how these two strategies influence one another and attempt to understand the process in which it succeeds (high-performance realised strategy) or how it fails (due to inertia, self-reinforcing mechanisms). Tanriverdi & Colleagues (2010) argument shares similarity.

Co-evolution was proposed by Lewin & Volberda (1999) to advance the selection-adaptation discourse in organisation studies and strategic management. They pose the question: does intentionality matter? As mentioned in this paper, previous research has often focused on planned change which adopts the selection mechanism and takes the side of the voluntarist ideology. However, as it has been identified – that change and strategy is emergent, characterised by adaptation which takes the view of a deterministic perspective. Co-evolutionary theory aims to incorporate both aspects where change and strategy “need not be an outcome of either managerial adaptation or environmental selection but rather the joint outcome of managerial intentionally and environmental effects” (Lewin & Volberda, 1999: 526). SA researchers have typically taken the perspective of intentionality, looking at plans.

So, how far have IS scholars come in framing co-evolution within the SA domain? To date, there is only one published paper on incorporating the co-evolutionary lens to understand SA, but is purely theoretical (Benbya & McKelvey, 2006). The authors’ main argument is that “the coevolutionary and emergent nature of alignment has rarely been taken into consideration in IS research and that this is the reason behind why IS alignment is so difficult” (Benbya & McKelvey, 2006: 284, emphasis in original). While the authors develop a convincing reason as to how SA is co-evolutionary and that firms and their respective environment are complex, the application of complexity theory (scale-free theories) are rather descriptive and do not offer IS researchers who are not acquainted with physics- and mathematical-derived concepts a way forward and build on the content. In addition, it is unclear which approach one should take in
examining these dynamics within a complex system. One point however that merits further attention was the use of co-evolutionary properties (as defined by Lewin & Volberda, 1999) where Benbya & McKelvey drew on them to further understand complexity within organisations and their co-evolving processes. The four co-evolutionary properties are: multilevelness/embeddedness, multidirectional causalities, feedback loops and path/history dependence.

### 3.2.1 Co-evolutionary Properties

The following co-evolutionary properties are of interest to scholars as they are present in all systems under investigation. What this means is that these properties have the ability to guide research and bring new insights. These properties can be identified and examined using sensemaking strategies (Langley, 1999; Kouame & Langley, 2018) from processual research.

**Multilevelness** and **embeddedness** suggest that coevolution takes place on multiple levels and that these levels are embedded (Lewin & Volberda, 1999). The implications for this property are the need for multi-level tracing of strategy process – which have been previous ignored in SA research (Benbya & McKelvey, 2006) and has caused limitations in contingency-based studies (Chan et al., 1997). Visual mapping can be employed as a sensemaking strategy to understand how events, decisions, actions and outcomes are connected to larger event timeline (Langley, 1999). This approach allows one to trace strategy processes over multiple levels of analysis – similar to Siggelkow’s (2002) map of interactions in his single case study. Additionally, as SA researchers are interested in how micro-level processes lead to macro level outcomes (Liang et al., 2017), linking these connections due to embeddedness can bring the field forward. Kouame & Langley (2018: 565) offer two main strategies for doing so: 1) progression, to show mutual influence between micro and macro over time – which assumes that micro and macro processes are recursively interconnected; and 2) instantiation, to show how microprocesses accomplish macro outcomes which is built around the mechanism of emergence (micro constitutes macro changes).

**Multidirectional causalities** refer to how changes on the micro-level can produce change on the macro-level, and vice versa. Multidirectional causalities provide insights into the process of change; for example: Pettigrew (1990: 270) suggests that the analyst of change have to recognise that “activities at some levels of context may be more visible and rapid than at other levels, and thus in the short-term sources of change may appear unidirectional, while in the longer term a multidirectional pattern may appear”. This will require the research to map out
long-term trajectories to identify multidirectional causalities. In this instance, temporal bracketing can be used as it allows one to decompose many simultaneously-occurring temporal processes. As Langley (1999: 703) explains, it is “especially useful if there is some likelihood that feedback mechanisms, mutual shaping, or multidirectional causality will be incorporated into the theorisation”. This sensemaking strategy is also useful in analysing two strategies simultaneously in a sequential manner (Langley, 1999) – bottom-up emergent processes as well as top-down planned/deliberate processes.

*Feedback* refers to recursive interactions between systems and subsystem leading them to influence each other. The general systems theory is “based upon the principle of feedback… providing mechanisms for goal-seeking and self-controlling behaviour” (von Bertalanffy, 1968: 90). This property can be referred to as ‘retention’ in the evolutionary process, where feedback leads to the retention of certain actions and decisions that produce long-term strategic alignment. Similar to the last two properties, visual mapping and temporal bracketing can be used together to identify feedback. Specifically, once the visual map is produced and temporal bracketing initiated, one can identify the feedback loops between decisions and their resultant events.

*Path and history dependence* is the result of the solidifying effects of positive feedback loops (inertia). History dependence of weak SA will make it difficult to achieve or break the path towards sustainable alignment. Reynolds & Yetton (2015: 102) employ path dependence assumptions into their research to help “explain the process by which strategy persists over time”, to portray that past decisions cannot be easily reversed. This is also supported by Hirschheim & Sabherwal (2001) who identify possible problematic trajectories based on three alignment profiles. To understand and trace the path dependence process in an organisational context one must observe events and decisions (as identified by the sensemaking strategies) and look at how they impact those events and decisions that have succeeded them (Koch, 2011). Additionally, the identification of these paths builds on the previous identification of feedback loops. In the context of SA, the strategic path of both business and IS strategies need to be understood to identify how trajectory is impacted by tension produced by emergent and top-down planned strategising processes. Since the area of path dependence is relatively new, Koch (2011) develops a six-step procedure to analyse strategic processes that may prove useful in future SA research – as it also explains phenomena in complex adaptive systems.
To conclude, the analysis of co-evolutionary properties may provide new insight into the dynamic nature of strategising as well as SA specifically. Many complexity theories are mathematically modelled through agent-based simulation such as the Monte Carlo simulation. However, qualitative processual research also offers the researcher an ability to investigate and understand complexity.

4.0 Conclusion

This paper addresses the criticism that the quest for continuing SA research should be abandoned and that alignment is undesirable. However, based on the counterargument – it seems that SA can be advanced significantly, as suggested by special issues that promote the use complexity-based concepts. A way to advance the SA research by the incorporation of complexity-based concepts along the lines of co-evolutionary properties. These properties can be studied using a critical realist approach in addition to the use of processual theories. Understanding these properties will bring research towards a new paradigm that embraces complexity. This is similar to the trajectory of organisation studies which took a closed-system perspective, then a cybernetic view of the organisation and top management as the dominant coalition, after an open-system – and now, a complex adaptive system perspective. Overall, previous literature employing the contingency-based approach has provided a great foundation for the topic. This foundation can now use processual insights to develop the topic further.

5.0 References


STRATEGIC ALINGMENT: TOWARDS A HOLISTIC PERSPECTIVE EMBRACING COMPLEXITY – ADVANCING THE RESEARCH AGENDA


STRATEGIC ALIGNMENT: TOWARDS A HOLISTIC PERSPECTIVE EMBRACING COMPLEXITY – ADVANCING THE RESEARCH AGENDA


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MEASURING EFFICIENCY AND PRODUCTIVITY OF ICT INFRASTRUCTURE UTILIZATION

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The paper discusses how Data Analytics can be used to investigate how ICT infrastructure is being utilized within the educational component of the human development index using non parametric methods. It is particularly aimed towards any of the following topic areas for the conference:

- Bridging the Digital Divide: emancipatory IS
- Business Intelligence and Decision Support
- IS Innovation, Adoption and Diffusion
MEASURING EFFICIENCY AND PRODUCTIVITY OF ICT INFRASTRUCTURE UTILIZATION

Abstract
Several researches have been carried out with respect to ICT Infrastructure Investments made by nations in a bid to bridge the digital divide and improve quality of life and the Human Development Index (HDI). With a strong argument being made in the literature for continued investments in ICT Infrastructure, this research investigated the relative efficiency and productivity of ICT Infrastructure Utilization in Education. The research employed the Data Envelopment Analysis (DEA) and Malmquist Index (MI) non-parametric research methodology with Arab States, Europe, Sub-Saharan Africa and World regions forming the Decision-Making Units. With Data collected from the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the International Telecommunications Union (ITU), findings show a relatively efficient utilization and steady increase in productivity for the regions but with only Europe and Arab States currently operating in a state of positive growth in productivity.

Keywords: Data Analytics, Data Envelopment Analysis, Malmquist Index, ICT4D, Learning Analytics
1.0 Introduction

The growth of Information and Communication Technology (ICT) in recent years has been remarkable in all countries and sectors throughout the world because of its transformational power that favours productivity and efficiency (Kayisire & Wei, 2016). Many governments have heeded the call for increased investments in ICT with the aim to improve national development with respect to the Human Development Index (HDI). This is based on the assumption that increasing investments in ICT will lead to improvements in productivity and other aspects of development at the organizational and national levels (Samoilenko & Osei-Bryson, 2017a). With Educational Attainment being one of the core indices for measuring Development with respect to the Human Development Index (UNDP, 2006; Bankole et al., 2011a; Bankole & Mimbi, 2017), and the overwhelming successes gained from Data Analytics in decision making, it is little wonder that Data Analytics has found its way into the Education Sector especially in ICT4D research. This field of Data Analytics in Education, otherwise known as Learning Analytics (LA) is fast gaining grounds in terms of research interests and advancement in technology (Oyerinde & Chia, 2017).

National development is said to encapsulate the notion of human development as the means of enlarging people’s choices to acquire knowledge, amongst other things, in order to have access to the resources needed for a decent standard of living (UNDP, 2006; Bankole & Mimbi, 2017). The need to understand the relevance of education in Human Development is well known and adequately acknowledged as it is important for social and economic development (Bankole & Assefa, 2017). It is therefore not a surprise that over the last three decades, research in national development has been expanded to certain intervening variables and social factors such as education and some other aspects of human welfare. (Desai, 1991; Anand & Ravallion, 1993; Bankole & Mimbi, 2017). This is ever more evident considering that countries have defined policies that show an emphasis on creating support mechanisms for the use of ICT, including for example, technical and pedagogical support as well as putting special attention on the use of ICT in teaching and learning (Hinostroza, 2018). However, the opinions on the bearings of ICT Infrastructure for development are in two perspectives vis a vis national development: The adoption of ICTs has the potential to empower communities and countries while secondly, the
ICT revolution can lead to imbalances and inequalities through lack of ICT adoption, access and usage (Bankole, 2015).

With the levels of ICT Infrastructure currently available, there is a need to understand the potentials of these nations to improve national development by investigating whether these ICT infrastructures are being utilized efficiently. Consequently, we can then measure their productivity levels over time with respect to the educational component of the HDI. In doing this, we take into consideration the standardized ICT indicators as determined by the World Summit on the Information Society (WSIS) and the United Nations Conference on Trade and Development (UNCTAD) in June 2004. In order to explore the utilization efficiency of these ICT infrastructure indicators, we use the following region groupings; Arab States; Europe; Sub-Saharan Africa; World and measure their productivity with respect to these indicators.

In this paper, we measure the efficiency and productivity of ICT Infrastructure utilization in education with respect to national development vis a vis adult literacy rates. We employ the Data Envelopment Analysis (DEA) and Malmquist Index (MI) approaches to carry out this research. The Malmquist Productivity Index is considered the most appropriate tool for measuring changes in efficiency and productivity (Arjomandi et al., 2015). This paper explores further findings from Oyerinde & Bankole, (2018) research which investigated the relative efficiency of ICT infrastructure utilization in education with data collected for 2010-2016. The rest of the article is organized as follows: section two provides the background, section three discusses the theoretical framework, section four provides the research methodology, section five provides the data analysis, section six provides the discussion of findings, section seven the limitations and section 8 the conclusion.
2.0 Background

There has been a rapid expansion during the last few decades in the use of non-parametric approaches in measuring the efficiency and productivity changes in education albeit mostly in education institutions (Arjomandi et al., 2015). A large number of these studies have been undertaken in developed countries (e.g., Athanassapoulos and Shale 1997; Abbott and Doucouliagos 2003; Emrouznejad and Thanassouli 2005; Johnes 2006). However, only a small, but growing, number of studies have so far attempted to use the Malmquist Index for this purpose, among them are Flegg et al., (2004); Carrington et al., (2005); Johnes (2008); Worthington and Lee (2008); Agasisti and Johnes (2009); and Bradley et al., (2010). Most of these studies have found productivity progress in different sectors, but this is mainly attributed to changes in technology and/or efficiency.

DEA has been used to measure efficiency for well over 3 decades and its applications spread over a wide range of thematic areas (Liu et al., 2013a). Some applications such as education and health care blossomed in the early days of DEA, while other applications, on the other hand, have just begun to apply DEA fairly recently (Liu et al., 2013b). A systematic survey on DEA applications was carried out by Liu et al., (2013b) and the results identified education as being one of the top five major application areas of DEA and prominent in its grand development. This is seen in Bessent & Bessent (1980), Charnes et al. (1981), Bessent et al. (1982), and Bessent et al. (1983). Liu et al., (2013b) discovered that historically, there have been two major groups of DEA applications in education in the literature. There is the one that studies the efficiency of higher education and that for basic education. The group for higher education includes Bessent et al. (1983), Sinuany-stern et al. (1994), Arcelus and Coleman (1997), Johnes (2006), and Johnes and Li (2008). The recent trend of efficiency studies in the education category clearly focuses on the higher education sector as articles mostly evaluate the performance of universities (Liu et al., 2013b).

There have been some studies that have used DEA to measure efficiency in education with respect to Human Development. Gupta & Verhoeven (2001) measured the efficiency of education in Africa and Clements (2002) measured efficiency of education in Europe. St. Aubyn (2002) and Afonso and St. Aubyn (2005, 2006a, 2006b) measured with respect to OECD

With the potential of educational technologies to positively improve educational quality and attainment, there is great optimism that efficient ICT infrastructure utilization in education can greatly increase both average literacy rates and educational attainment levels in developing economies (Oyerinde and Bankole, 2018). However, despite these promises being included in education policies that are related towards achieving a positive impact of ICTs on students’ achievements, there is no conclusive evidence to support this (Hinostroza et al., 2014). It is against this backdrop that we carry out this research to investigate the productivity of ICT infrastructure utilization in education over time using the Data Envelopment Analysis and Malmquist Index approaches.

3.0 Theoretical Framework

This research builds upon the Oyerinde & Bankole (2018) conceptual model for measuring the efficiency of ICT Infrastructure on Education. This model considers ICT infrastructure available for utilization. This conceptual model takes the form of a linear equation derived from Bankole et al., (2011b) model for measuring impact on education within the Human Development Index and expressed as:

\[ \log(E) = \alpha_o + \alpha_{HS}\log(H)\log(S) + \alpha_{TH}\log(T)\log(H) + \alpha_{TS}\log(T)\log(S) + \xi \]

Where:

\( E \) - the educational component of the human development index (HDI),
H - the Hardware Infrastructure,

S - the Software Infrastructure,

T - the Telecommunication Infrastructure

It can be considered to have similarity to another linear model, the translog production function framework (Ko and Osei-Bryson, 2004), in that it allows for pairwise interactions between the components of ICT. Therefore, the model for this study which reflects the above logarithmic expression is:

\[ \text{The impact on Education (Adult Literacy rates)} = f[\text{Internet Infrastructure (II)} + \text{Computer Infrastructure (CI)} + \text{Mobile Phone Infrastructure (MPI)}]. \]

In investigating the productivity, we use the classic Malmquist Index calculation model defined by Färe et al., (1994) and expressed as:

\[ MI = EC * TC = PC * SC * TC \]

where:

MI - Malmquist Index

EC – Efficiency Change

TC - Technical Change

PC - Pure efficiency Change

SC - Scale efficiency Change
4.0 Research Methodology

For this study, time series data from the United Nations Educational, Scientific and Cultural Organization (UNESCO); adult literacy rates and the International Telecommunication Union (ITU); individuals using internet and mobile phones, house-holds with computers and internet were obtained. Available data was collected for Arab States, Europe, Sub-Saharan Africa and World regional aggregates. These formed the four Decision Making Units (DMU’s). Data for the past 7 years, 2010-2016 was collected in percentages of the country population, with the ratio values computed annually as shown in Table 1. We employed Data Envelopment Analysis and Malmquist Index methodologies to calculate the relative efficiency and productivity of the regions respectively.

DEA is a well-known non-parametric linear programming method for measuring the relative efficiency (Thanassoulis et al., 2011; Bankole et al., 2011a). DEA is a data-oriented method for evaluating the performance (efficiency) of entities known as Decision Making Units (DMUs) (Bankole et al., 2011a) which uses input-output data to compute an efficient production frontier produced by the most efficient DMU’s (Bollou, 2006). DEA, unlike a parametric method, is context specific with respect to the interpretations of the results of the analysis, which are restricted to the sample and should not be generalized beyond the sample (Samoilenko & Osei-Bryson, 2017b). DEA, therefore, can then be viewed as a multiple-criteria evaluation methodology where DMUs are alternatives, and DEA inputs and outputs are two sets of performance criteria where one set (inputs) is to be minimized and the other (outputs) is to be maximized (Cook et al., 2014). In DEA, these multiple criteria are generally modelled as in a ratio form, e.g., the CCR ratio model (Charnes et al., 1978; Cook et al., 2014) which is expressed as:

\[
\text{max } e_{j0} \\
\text{subject to } e_j < 1 \\
\text{where }
\frac{\sum_{r=1}^s u_r y_{rfj}}{\sum_{i=1}^m v_i x_{ij}}
\]

where \(x_{ij}\) and \(y_{ij}\) represents DEA inputs and outputs, and \(v_i\) and \(u_r\) are unknown weights.
## Measuring Efficiency and Productivity of ICT Infrastructure Utilization

<table>
<thead>
<tr>
<th>DMU</th>
<th>Year</th>
<th>Individuals Using Internet</th>
<th>Individuals Using Mobile Phones</th>
<th>House Holds with Computers</th>
<th>House Holds with Internet</th>
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Table 1. Regional Data in Ratios to Population
Measuring Efficiency and productivity of ICT Infrastructure Utilization

Malmquist Productivity Index (MPI) measures the productivity changes along with time variations and can be decomposed into changes in efficiency and technology with DEA like non-parametric approach. Productivity decomposition into technical change and efficiency catch-up necessitates the use of a contemporaneous version of the data and the time variants of technology in the study period. The MPI can be expressed in terms of distance function (E) as Equation (1) and Equation (2) using the observations at time t and t+1.

\[
MPI_t = \frac{E_i(x^{t+1}, y^{t+1})}{E_i(x^t, y^t)} \quad \text{........................................... (1)}
\]

\[
MPI_{t+1} = \frac{E_i(x^{t+1}, y^{t+1})}{E_i(x^t, y^t)} \quad \text{........................................... (2)}
\]

where I denotes the orientation of MPI model.

The geometric mean of two MPI in Equation (1) and Equation (2) gives the Equation

\[
MPI_t^G = (MPI_t \cdot MPI_{t+1})^{1/2} = \left[ \left( \frac{E_i(x^{t+1}, y^{t+1})}{E_i(x^t, y^t)} \right) \cdot \left( \frac{E_i(x^{t+1}, y^{t+1})}{E_i(x^t, y^t)} \right) \right]^{1/2} \quad \text{........................................... (3)}
\]

The input oriented geometric mean of MPI can be decomposed using the concept of input oriented technical change (TC) and input oriented efficiency change (EC) as given in the Equation

\[
MPI_t^{\text{EC}} = (EC_t) \cdot (TC_t) = \left( \frac{E_i(x^{t+1}, y^{t+1})}{E_i(x^t, y^t)} \right) \cdot \left( \frac{E_i(x^{t+1}, y^{t+1})}{E_i(x^t, y^t)} \right) \quad \text{........................................... (4)}
\]

The first and second terms represent the efficiency change (EC) and the technology change (TC) respectively. MPI given by Equation (3) and Equation (4) can be defined using DEA like distance function. That is, the components of MPI can be derived from the estimation of distance functions defined on a frontier technology. Färe et al., (1994) provided the formal derivation of MPI and it is the most popular method among the various methods that have been developed to estimate a production technology (Coelli et al., 2005; Thanassoulis 2001). By utilizing both CRS and VRS DEA frontiers to estimate the distance functions in Equation (4),
Measuring Efficiency and productivity of ICT Infrastructure Utilization

the TC can be decomposed into scale efficiency (SC) and pure technical efficiency (PC) components. SC is given in equation (5) and PC is given in equation (6) (Lee et al., 2011).

\[
SC = \left[ \frac{E_{vrs}^{t+1}(x^{t+1}, y^{t+1})}{E_{vrs}^{t+1}(x^t, y^t)} \cdot \frac{E_{crs}^{t+1}(x^{t+1}, y^{t+1})}{E_{crs}^{t+1}(x^t, y^t)} \right]^{1/2} \quad \ldots \quad (5)
\]

\[
PC = \frac{E_{vrs}^{t+1}(x^{t+1}, y^{t+1})}{E_{crs}^{t+1}(x^t, y^t)} \quad \ldots \quad \ldots \quad (6)
\]

Conceptually, however, the mechanism for estimating changes in a DMU using DEA is intuitive as the position of a DMU changes over time and is thus measured by means of MI. The change in the position of a DMU, and the corresponding value of MI, is comprised of two components, the changes in Efficiency (EC) and changes in Technology (TC). With regards to the changes in MI, a value equal to 1 means no change in productivity, while a value of greater than 1 or less than 1 reflects a growth or decline in productivity respectively (Samoilenko & Osei-Bryson, 2017b).

5.0 Analysis

The Input-Oriented Data Envelopment Analysis was carried out to determine the relative efficiency of ICT Utilization. The Analysis was run for each year to determine the relative efficiency for each of the DMU’s. Table 2 shows the summary of the results for both the Variable Returns to Scale and Constant Returns to Scale models.

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Table 2. Data Envelopment Analysis Results
The choice of an Input-Oriented model is based on the theoretical assumption that the ICT Infrastructure (Input) indices are controllable and an increase or decrease in the levels of these inputs is expected to bring about a corresponding increase or decrease in the Adult Literacy levels (Output) indices respectively (Oyerinde and Bankole, 2018). Practically, however this may not be the case as effective utilization of the Inputs may or may not be properly controlled and therefore become subjective to particular users and participants. Therefore, we use both the Constant Returns to Scale (CRS) and the Variable Returns to Scale (VRS) methods to enable us measure the relative efficiency without assuming the inputs are controllable (Oyerinde and Bankole, 2018) and catering for both scenarios. Table 3 gives a more detailed DEA result where:

- $t-1$ – Base time moment
- $t$ – New time moment
- $\text{CRS} (t-1)$ – CRS efficiency in base moment relative to base frontier
- $\text{CRS} (t)$ – CRS efficiency in analyzed moment relative to new frontier
- $\text{CRSMix} (t,t-1)$ – CRS efficiency in analyzed moment relative to base frontier
- $\text{CRSMix2} (t-1,t)$ – CRS efficiency in base moment relative to new frontier
- $\text{VRS} (t-1)$ – VRS efficiency in base moment relative to base frontier
- $\text{VRS} (t)$ – VRS efficiency in analyzed moment relative to new frontier

The Malmquist Index Analysis was carried out using the KonSi Malmquist Index Software. Table 4 shows the outcome of the MI calculation. This software allows us to calculate Malmquist index using three calculation methods:

i. Fixed base

ii. Adjacent base

iii. Seasonal calculation
<table>
<thead>
<tr>
<th>DMU</th>
<th>t-1</th>
<th>t</th>
<th>CRS (t-1)</th>
<th>CRS(t)</th>
<th>CRSMix (t,t-1)</th>
<th>CRSMix2 (t-1,t)</th>
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Table 3. Detailed CRS and VRS DEA Results

For this research we use the Adjacent base method. This method assumes that each time moment is selected as the base moment and the moment next to base is considered as the analyzed time moment. Each moment is subsequently selected as the base moment and the one next to it the analyzed moment and so on. Calculations are performed for the following time moment pairs:

\[ t_1 \text{ and } t_2 \]
Measuring Efficiency and productivity of ICT Infrastructure Utilization

\( t_2 \) and \( t_3 \)

... 

\( t_{n-1} \) and \( t_n \)

Which can further be represented as:

\[ MI(t_1, t_2) \cdot MI(t_2, t_3) \cdots MI(t_{n-1}, t_n) \]

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<tr>
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<th>Base Time Moment (t - 1)</th>
<th>Analyzed Time Moment (t)</th>
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<th>Pure Efficiency Change (PC)</th>
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<th>Technology Change (TC)</th>
<th>Malmquist Index (MI)</th>
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<tr>
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Table 4. Malmquist Index Analysis Results
6.0 Discussion of Findings

The result of the analysis shows that using both the CRS and VRS methods of the Input Oriented Data Analysis Model, the regions are relatively efficiently using their ICT infrastructure with respect to the educational component of the HDI. There has been a marginal increase from 2010 to 2016 in the relative efficiencies of ICT infrastructure utilization in education for the regions being investigated. Europe, Sub-Saharan Africa and World regions show an optimal relative efficiency score using the VRS model with Arab States being least relatively efficient. With the CRS however only Sub-Saharan Africa has optimal relative efficiency with the others still having a decent relative efficiency score. It is however also important to note that from 2010 to 2016 all regions being investigated show a steady increase in relative efficiency from year to year as seen in Table 3. This can mean that there is a steady growth in the ICT infrastructure utilization efforts for education in the regions. This supports the notion that should there be an increase in ICT infrastructure in these regions, whether properly controlled or not, there should be a corresponding increase in adult literacy rates. An increase in adult literacy rates will bring about an increase in quality of life and human development with respect to the Nations HDI (Oyerinde and Bankole, 2018). Table 5 shows the average Relative Efficiency and MI values for the years of study.

<table>
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<th>Relative Efficiency</th>
<th>Malmquist Index</th>
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<td>World</td>
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</table>

Table 5. Average Relative Efficiency and Malmquist Index Values

In measuring Productivity, this research has been able to show that during the years of study there has also been a steady increase in productivity yearly across all regions. On the average however, there is still opportunity for continuous growth in productivity as the average values show that all regions are still operating in a declining state of productivity. However, from Table 4 we see that Arab states and Europe have moved into a state of growth in productivity.
from 2013, with Sub-Saharan Africa and World still yet to score above 1.0000 MI productivity values although showing a steady increase in productivity scores.

This may prove useful for policy makers and potential donors to the Sub-Saharan region for example, as we can see that the region is optimally relatively efficient in its utilization of ICT infrastructure for education. However, there is a big opportunity here for growth in its productivity in order to increase its HDI. Calls for increase in investments in ICT for education can therefore be justified and a strong case made for digital inclusion in education. Sustained investments and educational policies with regards to ICT infrastructure utilization in Europe for example can be justified and more digital inclusive models be developed and employed.

7.0 Limitations

The main limitation of this study is the availability of the data for the dataset. The data was collected from the United Nations Educational, Scientific and Cultural Organization (UNESCO) - educational attainments; World bank - literacy rates and the International Telecommunication Union (ITU) - individuals with computers, internet and mobile phones. Considering that the years being investigated are the most recent and the sources of the data are credible and well cited sources for scientific data collection, some countries within each region did not have data available for one or more years being investigated. This necessitated collecting the data in the regional groupings as was available. Having the raw data for the individual countries within the regions would have allowed for a more individualistic analysis and will allow us see not only how the regions compare amongst themselves, but also how constituent countries fare in relation to each other.
8.0 Conclusion

The research has been able to show that Learning Analytics is not limited to use of data analytics to facilitate teaching and learning. Data Analytics in education can be used to measure efficiency and productivity of ICT infrastructure utilization within this sector and also enable decision makers and policy makers make more informed decisions and policies regarding the educational component of the HDI vis a vis ICT infrastructure investments and utilizations. While acknowledging that that DEA as a methodology is context specific and by its very nature of being non-parametric does not allow for generalization, the research has been able to provide a means of not only measuring the relative efficiency but also being able to investigate productivity as well.
References


Hinostroza, J. E. (2018). New Challenges for ICT in Education Policies in Developing Countries: The Need to Account for the Widespread Use of ICT for Teaching and Learning


https://doi.org/10.1080/02681102.2015.1081862


The Power of a web-enabled marketing

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Abstract
In light of the increased adaptation of social media by consumers and businesses, guided by an evolving dynamic set of technologies and as the exponential growth derived by the development of new technologies promises even more reliance on social media as a marketing function. This paper, by focusing on the main reasons behind the wide acceptance of social media by consumers and businesses, examines the power of web-enabled marketing, which has made the marketplace more open and transparent than ever before. It also considers the opportunities that this situation creates. Several constructs of consumers’ perceived benefits were found to be enabled through the use of social media, mainly through the concept of value co-creation which enables empowerment, power, influence, input, ownership, engagement, accessibility, communication, connectivity and interaction. From a business perspective, several benefits were found to be enabled through the use of social media are co-creation, empowerment, power, connectivity, communication, enhanced innovation and knowledge management and data capture maximisation. Finally, the findings of this research suggest that the main reason for the adoption of social media amongst businesses and consumers is its user-friendly nature.

Key words: Social media, Communication, Web 2.0, e-WOM, Value co-creation
Introduction

Recent developments in social and mobile Information and Communication Technologies (ICTs) have facilitated change that has meant consumers are much more able to co-create their own experiences and value on an exceptional scale (Ramaswamy, 2011; Xiang and Gretzel, 2010). Supported by unprecedented growth in ICTs, the role of consumers has significantly evolved to one that see consumers engaged in value co-creation activities with businesses (Neuhofer and Buhalis, 2013). As such, social media empowers and facilitates interconnectivity between users, content and the business as enabled by communication technologies (Dann and Dann, 2011; Stokinger and Ozuem, 2014). Consumers are no longer passive and are increasingly seen as central actors participating in the creation of personalised experiences. This has resulted in redefined interactions between companies and consumers. Contemporary companies not only design and deliver experiences but facilitate essential requirements and value propositions that allow consumers to participate in, and co-create experiences to generate their own value (Vargo, Maglio and Akaka, 2008). Through social media, consumers can contribute to the value co-creation process with companies (Di Gangi and Wasko, 2009; Xie et al., 2016; Jalonen, 2017), presenting an opportunity for businesses to engage and solicit input and ownership from consumers through involvement in diverse co-creation processes. Consumers can now have a hand in designing and developing products, and they increasingly have a say in what service support should look like (Nambisan and Nambisan, 2008; Prahalad and Ramaswamy, 2004a). (moved to here and reworded).

Social media has dramatically changed the style in which companies and consumers communicate and interact (Dahan and Hauser, 2002). This has facilitated the capabilities of companies to engage consumers as co-creators of experience (Bartl, Fuller, Muhlbacher, and Ernst, 2012; Sawhney and Prandelli, 2000). Social media has empowered organisations to increase their reach and appeal to new potential customers, thus generating economic value and market growth. Social media proved instrumental for market intelligence; knowledge collected with the help of social media can be used by organisations to their prospective customers and to enhance customer experiences (Chen, Goes, Marsden, and Zhang, 2009).
This research aims to identify the main reasons behind the wide acceptance of social media as a web-enabled marketing platform by consumers and businesses and based on the concept of value co-creation, which presents an academic contribution. The research will aim to provide recommendations for marketing strategist to enable the development of more effective use of social media as a web-enabled marketing platform and to enable higher level of consumers’ co-creation involvement.

**Theoretical Context**

Social media is a global, useful application based on the technological foundations of the World Wide Web. It represents a means of social interaction facilitated by the Internet. There has been rapid progress in the usage of Social Media Applications (SMA) in recent years. Such progress has made consumers more aware of businesses and their products. It has also resulted in stronger connections between buyers and sellers. As Hew & Cheung, (2012) state, social media is grounded in the technologies of Web 2.0, which have experienced exponential growth resulting in the development of new technologies. Kaplan and Haenlein (2010) and Daugherty, Eastin, and Bright (2008) note that Web 2.0 technologies empower end-users to be able to use different kinds of media content, such as video, audio, images and comments. Customers can review, create, comment on, and share content on social media with the help of online networks. This means they are granted uninterrupted access to businesses, brands and marketers (Chau & Xu, 2012). Social media, as a term, describes a dynamic and evolving set of technologies (Kane et al., 2013) which has been described as a ‘moving target’ (Sinha et al., 2013; Hogan & Quan-Haase, 2010).

Safko (2010, p. 4) describes social media in general terms, noting that it comprises of two words, i.e. ‘social’ and ‘media’. ‘Social’ refers to ‘instinctual needs whereby humans have to connect with other humans’ and the ‘need to be around. This includes groups of similar, like-minded people with whom others feel at home around. Social media users are comfortable sharing their thoughts, ideas, and experiences with others who share the same interests. Media, in this context refers to ‘media we use to make connections with other humans’. Such media are ‘technologies we use to make those connections’.

Social media has affected the lives of many over recent decades. The main objective of social media is to connect people socially, but this definition has broadened, and it is now accepted
that social media connects people to industries. Many definitions of social media have been
developed, based on various studies. Most of these share a key commonality: that social media
encompasses platforms that are Internet-centred and encourage an unrestricted stream of user-
generated material (Kaplan and Haenlein, 2010; Safko, 2010; Kietzmann, Hermkens,
McCarthy, and Silvestre, 2011; Hanna, Rohm and Crittenden, 2011; Luo, Zhang and Duan,
2013; Ngai, Tao and Moon, 2015; Stokinger and Ozuem, 2015).

A social media platform is a channel used for communicating, not only amongst people who
want to connect with their friends and relatives, but also by businesses who seek to interact
with other organisations and users. It is an efficient method for individuals to communicate,
interact and connect to others within social networks. At the same time, social media is used
by many businesses to advertise products and services, and to interact with customers and
prospective customers. Social media compromises two-way communication, and offers
opportunities for individuals and businesses to take advantage of networks of people and
valuable digital spaces for the exchange of electronic Word-of-Mouth (e-WoM) (Kaplan and
Haenlein 2011). Social media differs from traditional communication methods in facilitating
two-way communication. Examples of one-way, traditional methods of communication
include newsletters, magazines, television, billboards, and radio (Hasan, 2011; Mangold and
Faulds, 2009). Social media is more efficient than traditional methods of communication as it
enables two-way communication and is technologically more hi-tech. There has been a shift in
focus from conventional media to online and digital media in the form of social networking
sites, wikis and blogs. This has given rise to viral marketing as a means of effective
communication and sharing information (Hutton and Fosdick, 2011). Businesses influence
consumers and consumers influence brand messages (Hanna et al., 2011). Social media
presents a strong opportunity for customers to exchange views with hundreds, and even
thousands of customers worldwide.

Businesses are not the only source of brand communication. Social media helps businesses to
formulate strategies and reduce R&D costs. By using social media, organisations can collect
information, develop databases and improve service delivery (Barnes, 2010). They can also
extend their geographical presence, as social media has worldwide reach (Wright et al., 2010).
Social media is preferred by many organisations and customers over traditional forms of media
to explore and collect information (Mangold and Faulds, 2009), the quality of which is richer.
The time needed to collect such information is also reduced. This ultimately results in improved products for consumers (Rathore et al., 2016). The roles of marketers have been reduced due to the dominance of consumers who can access focussed streams of information easily by harnessing user-friendly interfaces online. As a consequence, businesses using traditional organisational communications frameworks may be viewed as having features that are non-transparent (Ozuem and Tan, 2014; Sahni and Appiah (2019)).

Social media has many advantages, which many businesses utilise to interact with their customers. Taylor (2009) argues that social media is a highly effective global application. It is a powerful personalised tool which individuals can use to create and circulate matter by participating in discussions. Taylor (2012) asserts that from a promotional and marketing perspective, the obvious opportunity associated with any digital medium is interactivity. Social media is no different from another digital medium when it comes to interactivity. It affects not only our daily lives, but also the business activities we are familiar with. There has been a steady increase in the number of businesses adopting social media to market their goods and services. It is also utilised by firms to expand their conventional marketing activities. In the strategic marketing literature, social media is simply approached as a new method, but its purposes are far from new. Social media is used by businesses to grow sales and to improve the reputation of businesses (Sapena and Paniagua 2014). Organisations can take advantage of, and create value from consumer involvement in social media. Bechmann and Lomborg (2013) suggest that value can be created in the form of networks which facilitate the ability to update and contribute content. Social media also enhances organisational development and the innovation of new products and services. It supports the trading of information and data across numerous digital profiles.

Social media offers opportunities for consumers to participate in the value co-creation process with companies (Di Gangi and Wasko, 2009; Bechmann and Lomborg, (2013); Nambisan and Nambisan 2008; and Prahalad and Ramaswamy, (2004a). Bechmann and Lomborg (2013), have depicted various ways in which businesses can benefit from, and create value from customer involvement in social media. These benefits create value in various forms such as (a) networking, updating, and content contribution (b) contributing to business expansion and innovation; and (c) trading the data gained from the digital information profiles of users. Therefore, organisations intend to enable consumers to get involved in different co-creation processes with the help of social media. Examples include product design and development.
Customers actively take part in the co-creation process due to advances in technology that have resulted in the increased use of social and mobile ITCs. Social media and mobile applications have become facilitators of modifications that have helped consumers to connect, engage and participate, and to co-create their own experiences and create value on an extraordinary scale (Ramaswamy, 2011; Xiang & Gretzel, 2010). With the rise of social ICTS, buyers have become more active, dominant and involved in experience creation and consumption processes (Ramaswamy, 2009a). These expansions have promoted a change to the relationship between businesses and consumers, and they have advanced our understanding of how experiences and value are created and who creates these (Vargo & Lusch, 2004; Vargo et al., 2006; Sfandla & Bjork, 2013).

Social media is considered trustworthy by consumers, and this has resulted in a strong consumer focus to acquire information related to products and services (Foux, 2006). There are various benefits offered by social media, but security is a major concern (Parameswaran and Whinston, 2007). Viruses and other threats can potentially affect huge numbers of users of social media. These authors argue that such platforms are not well governed. Indeed, they are highly decentralised and can easily be accessed, which presents a high risk of illegal activity. Businesses continue to reap the benefits of incorporating social media to drive conversation, participation, community formation, information openness and connectedness as part of their business strategies. (Chan-Olmsted et al., 2013).

Ward and Ostrom (2006) draw attention to some of the disadvantages of social media for businesses, suggesting that such media can help organisations to access valuable knowledge about their customers including their personal information, interests and preferences. However, when customers are dissatisfied with particular goods or services, they can use social media to complain, and this can affect their loyalty towards brands. Such views can, in turn, influence others that are exposed to them. It is very difficult to control the creation of User Generated Content (UGC) in various forms, such as comments, views and reviews on social media. Social media is not a closed system, and marketers must be aware of the associated risks. Marketers are concerned about this, as any unfavourable input on an official website, blog or forum online can have lasting effects on the reputation of businesses (Ryan and Jones, 2009).
There are two different perspectives relating to the applicability of social media. Some scholars who have discussed the benefits of using social media have noted that organisations are willing to adopt the technology to enhance their businesses. In contrast, others are reluctant to adopt social media due to its open nature, which means that anyone can share a negative experience quite easily. These two contrasting perspectives have resulted in a growing body of research associated with social media. Some have assessed the impact of social media on businesses and consumers. Indeed, it has been argued that consumers have become empowered because social media has enabled them to voice negative opinions in relation to products and services. This power helps to reduce the physical and psychological costs to consumers (Ayertey, Ozuem and Appiah 2018). However, despite suspicions and opposition to the use of social media within organisational context, social media has indeed gained tremendous acceptance amongst contemporary users.

Conclusions and recommendations

This paper has explored the main reasons leading to acceptance of social media by consumers and business and based on the concept of Value Co-creation. Research has confirmed the significance of social media as a powerful platform for marketing and the role it plays in creating value for both consumers and businesses through the co-creation. Analysis revealed that several reasons were underlying consumers’ perceived benefits when using social media, primarily through the concept of value co-creation thus providing consumers a sense of empowerment, power, influence, input, ownership, engagement, accessibility, communication, connectivity and interaction. In terms of business perspective, also the analysis revealed that several benefits can be achieved when employing social media as a marketing platform and through the concept of Value Co-creation, namely creating a sense of empowerment of the business, power through extending their outreach and presence in the market, enhanced connectivity and interaction with consumers, increased communication, enhanced innovation and knowledge management and data capture maximisation. Also, the findings of this research suggest that the main reason for the adoption of social media amongst businesses and consumers is its user-friendly nature.

Social media is a modern-day requirement that is pervasive and growing in popularity. Technological developments have supported social media applications. On one hand, it
empowers businesses to promote and market their products and services on a large scale and on the other hand, it empowers the consumer who can gain knowledge and information about products and services and share experiences within likeminded communities. This has made the market place very transparent and open. Businesses must understand the significance of social media and incorporate it in their business strategies to reap the benefits it offers.

Businesses must keep in mind that social media tools have made the marketplace very transparent and have increased the awareness of consumers in terms of the different organisations, products, prices and features of various products and services they can access. Social media helps firms to expand their conventional marketing activities to formulate strategies that can reduce R&D costs. Social media marketing must be used in conjunction with traditional media to ensure that organisations are not missing out on any segment of their target customers, and that they are reaping the benefits of symmetrical communication.

The awareness that has developed due to the Internet, social media, technological advances and other computed-mediated marketing channels has empowered customers and prospective customers to become very active in terms of shaping their influences. Social media offers consumers the chance to access and share the experiences and knowledge they gain through various channels which means they are no longer passive. This has resulted in value co-creation by customers in the process of buying the products and services that meet their individual needs. The social media eco-system has resulted in a culture of openness and transparency that increases knowledge amongst consumers and increases the options they are presented with. Social media assists with the development of new products and helps business to develop new ideas, and new or modified product designs.

By using social media, organisations can collect information, develop databases and improve service delivery. Social media platforms can reduce the research and development costs that businesses have to typically account for. The products that are developed after gathering suggestions from customers have less chance of product failure and are more easily accepted by customers in the market once they are launched.
References:


Empirical study on Consumer Innovation by using Social Media in Japan

Abstract

Consumer innovation occurs when consumers improve existing products and develop new products by themselves. Consumers innovate products in Japan, although the incidence is lower than that of Western countries. On the other hand, social media spreads all over the world. Some previous studies indicate that network communities of social media are useful for consumer innovation. However, these empirical studies have not been researched yet in Japan. This paper reports the results of a survey into consumer engagement with product innovation by analyzing the questionnaire survey data, how to promote consumer innovation in Japan is clarified. Especially, the role of social media and its community and motivations of a lead user who is a consumer innovator are elucidated. We clarify the lead user plays a central role in the network community and wants monetary incentive. From these findings, we demonstrate how to combine consumer innovation with Japanese firms.

Keywords: Consumer Innovation, Social Media, Network Community, Lead User, Motivation, Monetary incentives

1.0 Introduction

Innovation is indispensable for the growth of a firm. Firms can gain competitive advantage by creating a variety of knowledge and developing excellent new products by themselves. However, the speed of technological progress has become faster. And the wider and deeper knowledge is needed to develop new products. In so doing, it has become more difficult to develop products in-house. Firms have shifted from so-called closed innovation processes towards a more open way of innovating. Open innovation is the use of purposive inflows and outflows of knowledge to accelerate innovation, and expand the markets for external use of innovation (Chesbrough, 2003, 2006a, 2006b). Open innovation requires establishing networks and collaborating between firms and between firms and customers. In open innovation, the most important source of acquiring external knowledge is a user (Cohen et al., 2002).

Until now, users have been regarded as just using products that manufacturing company supplies. However, some users develop new products themselves or improve existing products. These products are suitable for user needs and ideas, but they may have to be refined to sell as merchandise. Therefore, a firm needs to commercialize them with users. These users include not just firms but consumers (Franke and Shah, 2003; Lüthje, 2004; Lüthje et al., 2005; Hyysalo, 2009; von Hippel et al., 2011). Especially, in the case of final consumer goods, general
consumers sometimes have ideas and take charge of product development. Products development in collaboration with customers will become more important in the future. However, previous research on consumer innovation in Japan has not been done compared with USA and UK (von Hippel et al., 2011). This paper focuses on consumers in Japan.

Social media is useful for collecting user need and idea, and seeking collaborators of product development and consumer innovators. Therefore, social media is important for product innovation (Dodgson et al., 2006; Idota, et al., 2015a, 2015b) and user (consumer) innovation (Dong & Wub, 2015; Oginka & Dong, 2017; Pcauskas et al., 2018). In order to activate consumer innovation in Japan, social media should be further utilized. In this paper we study how to use social media to develop consumer innovation in Japan.

1.1 User innovation

Regarding user innovation, von Hippel (1976) find users discover many important functions, users make prototype by themselves and test them.

von Hippel (1994) cites information stickiness as a reason for user innovation. Innovation requires both information on problems and skills to solve them. Even if the manufacturing firms do marketing research, they cannot grasp all user needs. Only users have user needs. Because of this information asymmetry, users with highly sticky information should conduct innovation in order to optimize research costs and solve problems. Information stickiness may be defined as the incremental expenditure required to transfer that unit of information to a specified locus in a form usable by a given information seeker (von Hippel, 1994). When this cost is low, information stickiness is low; when it is high, stickiness is high. The cost of transferring the information necessary to bring about innovation has a tremendous influence on where innovation is caused. If the expenses are high, no information is transferred. In other words, when highly sticky information necessary for innovation is in the hands of a user with sufficient problem solving skills, information transfer is not carried out and users often innovate.

In this case, it is more cost effective for users to create technology and ideas themselves (von Hippel, 1994).

von Hippel (1986) also mentions that the lead user is central to user innovation. A lead user is an advanced user who leads the majority users about market trends. The
lead use will be motivate through vision, creativity and curiosity to fulfill a perceived need. In addition, von Hippel (2005) demonstrates that innovation which originated from lead user spreads in an innovation community. Users combine their activities and collaborate to develop products, test them and sell them through the innovation community.

Monetary incentive often do not exist or play no major role for motivation in the innovation community (Lakhani & von Hippel, 2003; Raasch and von Hippel, 2013). Major motives found in the innovation community refer to individual factors such as enjoyment and learning and social factors such as reputation, status and forms of reciprocity (Lakhani & von Hippel, 2003; Raasch and von Hippel, 2013).

The innovation communities may be physically or virtually located. The degree of user contribution rises with advances in information technology; information technology is accelerating the increase of users who are engaged in innovation (von Hippel, 2005).

1.2 Social media

Kaplan and Haenlein (2010) define social media as “a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0 and that allow the creation and exchange of user-generated content.” This concept of Web 2.0 is advocated by O'Reilly (2007). The web enables everyone to become both an originator and recipient of information. The Web has become a more dynamic and interactive means of communication. Thus, social media is a series of service for general users to express and share their individual interests, concerns, feelings, experiences, and knowledge.

The diffusion of social media has had a strong influence on the business activities of firms. Previous studies show that while social media brings business opportunities to firms, it may also turn out to be a threat for them, due to the inability of firms to control social media directly. Regarding the former, Rodriguez et al. (2012) suggest that social media use has positive influences on both the sales process and its results. That is, the use of social media provides good opportunities to promote sales, since it is beneficial for firms in learning from consumers as well as establishing a new market segment and long-run positioning. It is also useful for constructing mutual trust with consumers and raising economic value for consumers (Noone et al., 2011; Kate & Pavan, 2012). Information that consumers exchange through social media
contains useful content for product improvement and new marketing strategies (Haavisto, 2014). In other words, social media brings opportunities related to CRM (Customer Relationship Management) (Malthouse et al., 2013). The so-called word-of-mouth communication in social media becomes an effective means to obtain potential customers, sales improvement, and improvements in brand image (Luo & Zhang, 2013; Hausmann, 2012). Regarding the latter, negative aspects, however, consumers hesitate to buy products referred to them by social media because of experiences of reading adverse reputations posted in social media, which causes LTV (Life Time Value) to become lower (Malthouse et al., 2013). Thus, social media are double-edged swords, but firms tend to endeavour to use social media positively to enhance their businesses.

Firms are required to mobilize all managerial resources and networks to correspond to changes in consumer needs and the market and to achieve innovation. Social media greatly improves the ability to obtain and share information; it enables the identification of new findings from big data on a real time basis and facilitates the sharing of information among various related entities. These ICT (Information and Communication Technology) features lead to innovation, and have become one of the essential bases for promoting innovation (Dodgson et al., 2006; Lee & Xia, 2006; Idota, et al., 2015a, 2015b).

### 1.3 User innovation by using social media

Customers are actively participating in firm-sponsored innovation activity by posting and commenting on new ideas for improving the firms’ products and services, or to develop new ones (Oginka & Dong, 2017). Social media is useful of such the activity community. Social media is also useful for searching for lead users and other online users in an innovation communities (Brem & Bilgram, 2015; Dong & Wu, 2015; Oginka & Dong, 2017; Pacauskas et al., 2018).

Nowadays, advanced firms have started strategically using the online user innovation communities for open innovation initiatives (Dong & Wu, 2015).

Pacauskas et al. (2018) investigated a hamburger chain of Finland which conducted burger design contest by using social media. Their results show an important benefit from user innovation activities stems for customer learning. For example, a product design contest can provide a means to communicate a firm’s offerings to its customers and increase the consumers’ awareness of different options and their attribute.
Dong & Wu (2015) examine the impacts of online user innovation communities by using social media, using a large-scale panel data set from Dell and Starbucks. As the results, they find evidence that online user innovation communities enable implementation capability which increases firm value. Moreover, Oginka & Dong (2017) suggested from analysis of Starbucks’ data that user interactions and other users' feedback may stimulate a focal user's contribution to such communities.

In this way, social media is useful for user innovation. However, these previous researches have extended interpretation of user innovation (Brem & Bilgram, 2015; Dong & Wu, 2015; Oginka & Dong, 2017; Pacauskas et al., 2018). For example, online user innovation communities can be used to collect ideas and comments from users and they can support to select ideas and to evaluate prototypes based on users’ votes (Dong & Wu, 2015; Pacauskas et al., 2018).

There are three ways firms and consumers relate to new product development. Firstly, consumers provide information to a firm. A firm gathers and analyzes user needs and ideas. This approach involves passive user involvement. Secondly, a firm collaborates with customers to make new products Here the user is actively involved, testing prototypes and participating in various ways in product design. Thirdly, users or consumers improve and make products by themselves, that is, user innovation is conducted independently of the firm. Some products created by user innovators may subsequently be commercialized by a firm. Previous researches consider only the first and second approaches as user innovation (Brem & Bilgram, 2015; Dong & Wu, 2015; Oginka & Dong, 2017; Pacauskas et al., 2018). This paper focuses on the third approach to consumer innovation.

1.4 Proposes of this study

von Hippel, Ogawa and De Jong (2011) conducted a large international comparison study of user innovation in the United States, the UK and Japan. They found that percentage of consumer-innovators in the population aged 18 and over in the UK is 6.1% (n =1,173); 2.1% of the sample were creating consumer products and 4.5% were modifying consumer products. The consumer innovation rate in the USA is 5.2% (n=1,992); 2.9% created consumer products and 2.8% modified consumer products. Japanese rates were 3.7% (n=2,000), 1.7% and 2.5% respectively. Hence Japan has lower consumer innovators’ rate than Western countries.
Products improved or created by lead users in the process of consumer innovation are likely to meet the needs of other users. Therefore, user innovation is a key innovation type. How can we increase the user innovation rate in Japan like the USA and the UK?

One important key is the utilization of social media. Social media is also popular in Japan. According to Ministry of Internal Affairs and Communications in Japan (2016), 71.2% of people use SNS (Social Networking Service) in Japan. Previous studies show social media, especially user network communities, are useful for user innovation (Brem & Bilgram, 2015; Dong & Wu, 2015; Oginka & Dong, 2017; Pacauskas et al., 2018). However, such empirical research has not been conducted in Japan. There are also few empirical studies on how consumer innovation can be implemented (e.g. von Hippel, 2011).

Therefore, the purposes of this research are to clarify whether social media and network community are useful for consumer innovation in Japan and to clarify what kind of motivations are required for consumer innovation in Japan. From these findings, practical applications concerning how to combine consumer innovation with Japanese firms for diffusing consumer innovation are discussed.

To examine the above problems, this paper decomposes them into the following hypotheses:

H1: Social media use is effective for consumer innovation (Brem & Bilgram, 2015; Dong & Wu, 2015; Oginka & Dong, 2017; Pacauskas et al., 2018);

H2: Affiliation to network community is effective for consumer innovation (Brem & Bilgram, 2015; Dong & Wu, 2015; Oginka & Dong, 2017; Pacauskas et al., 2018);

H3: Lead users conduct consumer innovation (von Hippel, 1986; 2005, Lüthje & Herstatt, 2004);

H4: Motivators such as innovator or early adopter, cutting-edge member are important for consumer innovation (Franke & Shah, 2003; Ståhlbröst & Bergvall-Kåreborn, 2011); and

H5: Monetary incentive is not important for consumer innovation (Raasch and von Hippel, 2013).
2.0 Methodology

2.1 Questionnaire

We conducted the web survey on social media usage and consumer innovation experience in December 2017. We requested Rakuten Research Inc. to conduct this survey and it asked 3,000 people in Japan between the ages of 15 and 80 to respond the survey. These 3,000 valid responses are collected according to the gender and age composition rate of Japan. Questionnaire items consisted of usage of social media and network communication, consumer innovation experiences and motivation, and user attributes such as gender, age, and occupation.

2.2 Measures and data

This study employs probit regression, which enables the clarification of the relationships between consumer innovation and social media usage and network community. We distinguish the two type of consumer innovation. The former is existing product improvement by consumer innovation (EPI), whereas the latter is new product development by consumer innovation (NPD). The dependent variables are presence of these experiences (0 = no; 1 = yes).

On the other hand, the following variables are used for the independent variables based on the questions: (1) Presence of social media usage (0 = no; 1 = yes) ; (2) Presence of affiliation to network community (0 = no; 1 = yes) ; (3) Role in a network community such as “Administrator,” “General member,” and so on (1 = strongly disagree; 2 = disagree; 3 = undecided; 4 = agree; 5 = strongly agree); (4) Merit of belonging network community such as “presence of other community members’ support,” “Presence of support from community members who know experts without belonging to the community,” and so on (1 = strongly disagree; 2 = disagree; 3 = undecided; 4 = agree; 5 = strongly agree); (5) Presence of experience of supporting other member (0 = no; 1 = yes); (6) Reasons for supporting other members such as “I often recognize and get encouragement from members of the community,” “I am happy to get evaluation and appreciation,” “My community has the norm to help each other without reward,” “I trust all members of the community,” “I am happy to give others advice as an expert,” and so on (1 = strongly disagree; 2 = disagree; 3 = undecided; 4 = agree; 5 = strongly agree); (7) Lead user such as “If you know a lead
user, is the person with whom you have relationships only on the Internet?,” “If you
know a lead user, is the person (friends, colleagues, etc.) with whom I have
relationships outside the Internet?,” and “I am a lead user” (0 = no; 1 = yes); (8) Use
of results of consumer innovation such as “Results are shared in the community for
free,” “Many problems are solved in the community,” “Results are adopted and
commercialized by a firm,” and so on (1 = strongly disagree; 2 = disagree; 3 =
undecided; 4 = agree; 5 = strongly agree); (9) Motivation of user innovation such as
“It is important for me to use new products as soon as possible,” “I am regarded as a
cutting-edge member in my field (e.g. hobby, work),” “I have received benefits from
others’ ideas,” and so on (1 = strongly disagree; 2 = disagree; 3 = undecided; 4 = agree;
5 = strongly agree); and (10) Monetary incentive such as “I currently get monetary
rewards,” “I received monetary rewards in the past,” and “I want to get monetary
rewards in the future” (0 = no; 1 = yes).

In order to eliminate multicollinearity, if the correlation coefficient between
independent variables is 0.5 or more, either variable is removed.

The control variables are selected from questionnaire items which are high correlation
coefficient with the dependent variables. As a result, control variables are the
following variables: (1) Gender (0 = female; 1 = male); (2) Age such as “Less than 40
years old” (0 = 40 years old and more; 1 = less than 40 years old); (3) Occupation
such as “University student,” “Employee,” and “Top manager” (0 = no; 1 = yes).

Table 1 shows basic statistics of the independent variables, the selected dependent
variables and the control variables. EPI of consumer innovation rate is 2.20% and rate
of NPD is 1.97%. These percentages are similar to von Hippel’s previous research
(von Hippel et al., 2011). Social media usage rate is 70.6%. This rate is also same to
Ministry of Public Management’s research (Ministry of Public Management, 2017).
<table>
<thead>
<tr>
<th>Variables</th>
<th>Obs</th>
<th>Avg.</th>
<th>Std. Dev.</th>
<th>Min</th>
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<td>5</td>
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<td>3.49</td>
<td>1.22</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Merit of network community</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other community members' support</td>
<td>602</td>
<td>2.88</td>
<td>1.19</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Community members who know experts outside the community support me</td>
<td>602</td>
<td>2.63</td>
<td>1.14</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Experience of supporting other member</td>
<td>602</td>
<td>0.57</td>
<td>0.50</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Reasons for supporting other members</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I often recognize and get encouragement from members of the community.</td>
<td>343</td>
<td>3.49</td>
<td>0.96</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>I am happy to get evaluation and appreciation.</td>
<td>343</td>
<td>3.85</td>
<td>0.93</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>My community has a norm to help each other without reward.</td>
<td>343</td>
<td>3.36</td>
<td>1.07</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>I trust all members of the community</td>
<td>343</td>
<td>3.70</td>
<td>0.90</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>I am happy to give others advice as an expert</td>
<td>343</td>
<td>3.38</td>
<td>1.00</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Lead user</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If you know a lead user, is the person with whom you have relationships only on the Internet?</td>
<td>210</td>
<td>0.57</td>
<td>0.50</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>If you know a lead user, is the person (friends, colleagues, etc.) with whom you have relationships outside the Internet?</td>
<td>210</td>
<td>0.42</td>
<td>0.50</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>I am a lead user.</td>
<td>210</td>
<td>0.33</td>
<td>0.47</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Result of consumer innovation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Results are shared in the community for free.</td>
<td>210</td>
<td>3.48</td>
<td>0.94</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Many problems are solved in the community.</td>
<td>210</td>
<td>3.30</td>
<td>0.91</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Results are adopted and commercialized by a firm.</td>
<td>210</td>
<td>2.99</td>
<td>1.08</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Motivation of consumer innovation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>It is important for me to use new products as soon as possible.</td>
<td>424</td>
<td>3.19</td>
<td>1.14</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>I am regarded as a cutting-edge member in my field (e.g. hobby, work).</td>
<td>424</td>
<td>2.76</td>
<td>1.11</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>I have received benefits from others' ideas.</td>
<td>424</td>
<td>2.76</td>
<td>1.13</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Monetary incentive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I currently get monetary rewards.</td>
<td>424</td>
<td>0.08</td>
<td>0.26</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>I received monetary rewards in the past.</td>
<td>424</td>
<td>0.13</td>
<td>0.33</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>I want to get monetary rewards in the future.</td>
<td>424</td>
<td>0.32</td>
<td>0.47</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Gender</td>
<td>3,000</td>
<td>0.50</td>
<td>0.50</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 40 years old</td>
<td>3,000</td>
<td>0.34</td>
<td>0.47</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Occupation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>University student</td>
<td>3,000</td>
<td>0.04</td>
<td>0.19</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Employee</td>
<td>3,000</td>
<td>0.51</td>
<td>0.50</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Top Manager</td>
<td>3,000</td>
<td>0.05</td>
<td>0.22</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 1. Basic statistics
3.0 Findings

3.1 Estimation model 1: social media use and consumer innovation

This study employs probit analysis, which enables the clarification of the relationships between two types of consumer innovations and social media usage. Dependent variables are two types of consumer innovations, while independent variables are social media use and control variables. Table 2 shows the results of estimation. In both types of consumer innovations, social media use was significant plus (p<0.01). Thus, H1 was supported.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Consumer innovation</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>EPI</td>
<td>NPD</td>
</tr>
<tr>
<td>Social media use</td>
<td>0.526***</td>
<td>0.194</td>
<td>0.918***</td>
</tr>
<tr>
<td>Gender</td>
<td>0.311***</td>
<td>0.118</td>
<td>0.231*</td>
</tr>
<tr>
<td>Less than 40 years old</td>
<td>0.475***</td>
<td>0.119</td>
<td>0.411***</td>
</tr>
<tr>
<td>University student</td>
<td>0.371</td>
<td>0.231</td>
<td>0.473**</td>
</tr>
<tr>
<td>Employee</td>
<td>0.232*</td>
<td>0.14</td>
<td>0.172</td>
</tr>
<tr>
<td>Top manager</td>
<td>0.514**</td>
<td>0.232</td>
<td>0.535**</td>
</tr>
<tr>
<td>Constant</td>
<td>3.062***</td>
<td>0.215</td>
<td>3.370***</td>
</tr>
<tr>
<td>Observations</td>
<td>3,000</td>
<td></td>
<td>3,000</td>
</tr>
<tr>
<td>Pseudo R-squared</td>
<td>0.0965</td>
<td></td>
<td>0.107</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>-286.6</td>
<td></td>
<td>-259.2</td>
</tr>
</tbody>
</table>

Note: *** p<0.01, ** p<0.05, * p<0.1

Table 2. Social media use and consumer innovation

3.2 Estimation model 2: network community and consumer innovation

Here we analyse the influence of the network community on consumer innovation. First of all, dependent variables are the same as previous estimation, while independent variables are affiliation of network community and control variables. Affiliation of network community was significant plus for both consumer innovations (EPI: p<0.01; NPD: P<0.01) (see table 3). Therefore, H2 was supported.

Secondly we changed this independent variable to affiliation of network community to rule of network community such as “administrator” and “general member.” “Administrator” was significant plus for both consumer innovations (EPI: p<0.01; NPD: P<0.01), however “general member” was significant for neither.

Thirdly, we also changed this independent variable to examine merit of belonging to a network community such as “Other community members’ support” and “Community
members who know experts without belonging to the community support me.”
“Community members who know experts without belonging to the community
support me” was both significant plus (EPI: p<0.05; NPD: P<0.01). However, “Other
community members’ support” was only significant plus about EPI (p<0.05).
Fourthly, we changed this independent variable to experience of supporting other
member. Experience of supporting other member was both significant plus (EPI:
p<0.01; NPD: P<0.01).
Finally, this independent variable was changed to reasons for supporting other
members such as (1) “I often recognize and get encouragement from members of the
community,” (2) “I am happy to get evaluation and appreciation,” (3) “My
community has a norm to help each other without reward,” (4) “I trust all members of
the community,” and (5) “I am happy to give others advice as an expert.” (1) “I often
recognize and get encouragement from members of the community” was both
significant plus (EPI: p<0.01; NPD: p<0.05). (5) “I am happy to give others advice as
an expert” was only significant plus about EPI (p<0.1). On the other hand, (4) “I trust
all members of the community” was both significant minus (EPI: p<0.01; NPD:
p<0.1).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Consumer innovation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EPI</td>
</tr>
<tr>
<td>Affiliation of network community</td>
<td>1.012***</td>
</tr>
<tr>
<td>Gender</td>
<td>0.300**</td>
</tr>
<tr>
<td>Less than 40 years old</td>
<td>0.389***</td>
</tr>
<tr>
<td>University student</td>
<td>0.225</td>
</tr>
<tr>
<td>Employee</td>
<td>0.163</td>
</tr>
<tr>
<td>Top manager</td>
<td>0.376</td>
</tr>
<tr>
<td>Constant</td>
<td>2.943***</td>
</tr>
<tr>
<td>Observations</td>
<td>2,120</td>
</tr>
<tr>
<td>Pseudo R-squared</td>
<td>0.179</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>-230</td>
</tr>
</tbody>
</table>

Note: *** p<0.01, ** p<0.05, * p<0.1

Table 3. Network community and consumer innovation

3.3 Estimation model 3: lead user and consumer innovation
Next, we examined what types of lead users affect consumer innovation. In this case,
the dependent variables are the same as previous estimation, while the independent
variables are constructed by the following three types of lead users: (1) A person on
the Internet as “If you know a lead user, is the person with whom you have relationships only on the Internet?”; (2) A person outside the Internet as “If you know a lead user, is the person (friends, colleagues, etc.) with whom I have relationships outside the Internet?”; and (3) myself as “I am a lead user”. In addition to these, same control variables are included.

Regarding the results of estimation, myself as “I am a lead user” was significant plus for both consumer innovation (EPI: p<0.01; NPD: p<0.01) (see table 4). However, a person on the Internet and a person outside the Internet were not significant.

Since it was confirmed that a lead user is useful for two types of consumer innovations, H3 was supported.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Consumer innovation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EPI</td>
</tr>
<tr>
<td>A person on the Internet</td>
<td>0.294 0.238</td>
</tr>
<tr>
<td>A person outside the Internet</td>
<td>0.336 0.22</td>
</tr>
<tr>
<td>Myself</td>
<td>0.854*** 0.239</td>
</tr>
<tr>
<td>Gender</td>
<td>0.23 0.225</td>
</tr>
<tr>
<td>Less than 40 years old</td>
<td>0.435* 0.231</td>
</tr>
<tr>
<td>University student</td>
<td>0.364 0.434</td>
</tr>
<tr>
<td>Employee</td>
<td>0.282 0.298</td>
</tr>
<tr>
<td>Top manager</td>
<td>0.098 0.502</td>
</tr>
<tr>
<td>Constant</td>
<td>2.051*** 0.371</td>
</tr>
<tr>
<td>Observations</td>
<td>210</td>
</tr>
<tr>
<td>Pseudo R-squared</td>
<td>0.182</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>-95.25</td>
</tr>
</tbody>
</table>

Note: *** p<0.01, ** p<0.05, * p<0.1

Table 4. Lead user and consumer innovation

3.4 Estimation model 4: motivation of consumer innovation

This section focused motivation of consumer innovation In other words, the kind of motivation that promotes consumer innovation is analyzed. Again two types of consumer innovations are taken as the dependent variables, while the independent variables are as follows: (1) “It is important for me to use new products as soon as possible”; (2) “I am regarded as a cutting-edge member in my field (e.g. hobby, work)”; and (3) “I have received benefits from others’ ideas” and control variables.

The results of estimation are shown in Table 5. As the results, (1) “It is important for me to use new products as soon as possible” was only significant plus of EPI (p<0.05),
while, (2) “I am regarded as a cutting-edge member in my field (e.g. hobby, work)” and (3) “I have received benefits from others’ ideas” were found to be only significant plus of NPD (p<0.05; p<0.01). H4 was partly supported.

<table>
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<tr>
<th>Variables</th>
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</tr>
</thead>
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<tr>
<td></td>
<td>EPI</td>
</tr>
<tr>
<td></td>
<td>NPD</td>
</tr>
<tr>
<td>It is important for me to use new products as soon as possible.</td>
<td>0.209**</td>
</tr>
<tr>
<td>I am regarded as a cutting-edge member in my field (e.g. hobby, work).</td>
<td>0.134</td>
</tr>
<tr>
<td>I have received benefits from others' ideas.</td>
<td>0.109</td>
</tr>
<tr>
<td>Gender</td>
<td>0.215</td>
</tr>
<tr>
<td>Less than 40 years old</td>
<td>0.352**</td>
</tr>
<tr>
<td>University student</td>
<td>0.148</td>
</tr>
<tr>
<td>Employee</td>
<td>0.161</td>
</tr>
<tr>
<td>Top manager</td>
<td>0.234</td>
</tr>
<tr>
<td>Constant</td>
<td>2.903***</td>
</tr>
<tr>
<td>Observations</td>
<td>424</td>
</tr>
<tr>
<td>Pseudo R-squared</td>
<td>0.124</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>-160.5</td>
</tr>
</tbody>
</table>

Note: *** p<0.01, ** p<0.05, * p<0.1

Table 5. Motivation and consumer innovation

### 3.5 Estimation model 5: monetary incentive of consumer innovation

The fifth hypothesis tested whether monetary incentive affects consumer innovation. The dependent variables are again two types of consumer innovations, while the independent variables consists of the following: (1) “I currently get monetary rewards”; (2) “I received rewards in the past”; (3) “I want to get rewards in the future” and control variables. As the result shown in Table 6, (1) “I currently get monetary rewards” and (2) “I received rewards in the past” were significant pluses for both consumer innovation types (EPI: p<0.01; NPD: p<0.01). However, (3) “I want to get rewards in the future” was only a significant plus for NPD (p<0.05). Monetary incentive affect consumer innovation is founded. Therefore, H5 was denied.

Finally, we confirm how to make use of results better suited for consumer innovation. The dependent variables are same as above, while the independent variables are consists of the followings: (1) “Results are shared in the community for free”; (2)
“Many problems are solved in the community”; (3) “Results are adopted and commercialized by a firm” and control variables.

(1) “Results are shared in the community for free” (EPI: p<0.1; NPD: p<0.05) and (3) “Results are adopted and commercialized by a firm” (EPI: p<0.05; NPD: p<0.1) were significant pluses for both types of consumer innovations, while, (2) “Many problems are solved in the community” was not significant.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Consumer innovation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EPI</td>
</tr>
<tr>
<td></td>
<td>NPD</td>
</tr>
<tr>
<td>I currently get monetary rewards</td>
<td>1.293***</td>
</tr>
<tr>
<td>I received monetary rewards in the past</td>
<td>0.962***</td>
</tr>
<tr>
<td>I want to get monetary rewards in the future</td>
<td>0.227</td>
</tr>
<tr>
<td>Gender</td>
<td>0.263</td>
</tr>
<tr>
<td>Less than 40 years old</td>
<td>0.398**</td>
</tr>
<tr>
<td>University student</td>
<td>0.383</td>
</tr>
<tr>
<td>Employee</td>
<td>0.229</td>
</tr>
<tr>
<td>Top manager</td>
<td>0.135</td>
</tr>
<tr>
<td>Constant</td>
<td>1.950***</td>
</tr>
<tr>
<td>Observations</td>
<td>424</td>
</tr>
<tr>
<td>Pseudo R-squared</td>
<td>0.157</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>-154.6</td>
</tr>
</tbody>
</table>

Note: *** p<0.01, ** p<0.05, * p<0.1

Table 6. Monetary incentive and consumer innovation

4.0 Discussion

This study suggests that social media and their network communities are useful for consumer innovation. Such network communities have two merits for consumer innovation: Firstly they get other community members’ support and secondly they enable access to experts outside the community to whom a community member might have a connection or have knowledge about. A consumer innovator helps other members, because he/she has received benefits from others’ ideas. Consumer innovators support other members because of they themselves got recognition and encouragement from other members, and are therefore happy to give others advice as an expert. However, he/she may not trust the community as a whole. The consumer innovator may trust all the members of the community, but he / she knows that there are some members who are talented or who know other talented persons outside the community. He / she expects the members to support him/her when he / she is in
trouble. Due to that, consumer innovators support each other. This means reciprocity. Moreover, support from community members who knows an expert without the community indicates the value of weak ties (Granovetter, 1973). Granovetter (1973) points out that networks connected with weak ties have high information availability. By filling in gaps between networks, it becomes easier to acquire new information and resources by connecting relationships with other networks members. In such cases, contact with people who have not been contacted previously increases opportunities to access new information and innovative ideas, and it triggers innovation. This point also applies to a virtual network community in which the current user loosely connects with social media. In addition, Granovetter (1973) pays attention not only to the central connection but also to the marginal connection. Early innovators are the peripheral persons. However the central connection is important for innovation. In an innovation network, the strength of a strong tie by internal members is demonstrated (Krackhardt, 1992). Members exchange closely with each other, sharing values and behaviour patterns, transferring and sharing knowledge, and promoting innovation as a result.

Therefore, both the connection of community members themselves and the connections outside the community are important for consumer innovation.

In addition, the lead user who is consumer innovator conducts consumer innovation (von Hippel, 1986). Also the administrator of community is beneficial to consumer innovation above general member.

Lead users may play a central role in the network community. He/she is a cutting-edge member in his/her field, and wants to use new products as soon as possible. Our study suggest that the results of consumer innovation are not only shared in the community for free but also commercialized by firms. Monetary incentive is very important for consumer innovation, too. He/she received monetary rewards in the past and currently gets monetary reward from firms; he/she wants to get monetary rewards in the future. This result is different from previous research (Lakhani & von Hippel, 2003; Raasch and von Hippel, 2013). Raasch and von Hippel (2013) find “individuals can gain significant benefits from participating in an innovation process,” “important examples of innovation process benefits include enjoyment, learning and reputational gains,” and “when innovation project sponsors can offer volunteer innovators such benefits, the net cost of innovation projects can be much lower.”
However, based on the results of this analysis, we found that not only the pleasure of participating in the innovation process but also financial incentives are very important for consumer innovation.

5.0 Conclusion

In this paper, social media usage and its community are found to be effective for consumer innovation in Japan through the analyses of questionnaire a survey. In addition, this paper also examines what kind of motivation promotes consumer innovation in Japan. Consumer innovators are still a minority in Japan. However, particularly in the younger generation, innovators will collaborate with other members and improve and develop products by using social media.

In order to promote consumer innovation, Japanese firms need to find consumer innovators, to cooperate with them in developing products, and to commercialize them. The lead user who is the centre of consumer innovation plays also a central role in the network community. Because of that, top management and employees should join the network communities which relate to their work and contact administrator and active users. In so doing, they find lead users and their collaborators. They also should advise and support other network members. If lead users have great ideas or make prototypes, firms should actively commercialize them.

However, this study has some limitations. First, because of web survey, this data has bias that it does not contain data of people who are not using the Internet. However, we think that this data is acceptable because the percentage of social media user and consumer innovator of this data are similar to other preceding surveys. Secondly, our data is restricted to Japan. Similar investigations in other countries will be required in the future in order to identify success factors of consumer innovation.

Acknowledgement

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References


Open Innovation Practice in the UK-based Food Sector SMEs: Ethnic Minority

Habibur Rahman

University of the West of Scotland
Open Innovation Practice in the UK-based Food Sector SMEs: Ethnic Minority

Abstract

Innovation and technological modification are the essential sources of productivity growth, international competitiveness and proliferated living standards. In past years, these areas have become the focal points of growing attention due to relentless competition from rapidly emerging knowledge-based economies. In particular, research and policy have begun to focus on small and medium-sized enterprises (SMEs) as a fundamental source and driver of new product developments, innovation and new technologies. The development and implementation of open innovation is considered a potential way to distribute products to the market that have been produced because of the application of innovative techniques. Firms can earn the loyalty of customers through the practical implementation of open innovation strategies. Consequently, reputation can be built up incrementally. This paper aims to provide some insights into how open innovation could enhance the competitiveness of SMEs in the food industry, particularly within the UK ethnic minority.

Key words: Open innovation, food sector SMEs, potential challenges, technological usage, competitiveness

1.0 Introduction

The concept of open innovation has become a widespread phenomenon in both the US and Europe over the last decade (Chesbrough, 2003). Many SMEs depend on their ability to be innovative to gain competitive advantage (Parida et al., 2012). However, the usual success rate of innovative efforts tends to be lower than expectations. This is mainly due to the inherent complexity of innovation as well as to the high levels of risk alignment and uncertainty inherent to the innovation process (Griffiths-Hemans & Grover, 2006; Kouferos et al., 2005). In addition, innovative development is usually challenging for SMEs due to the ‘liability of smallness’. This is because SMEs have limited financial resources (Grando & Belvedere, 2006). Furthermore, a lack of multidisciplinary competence and less structured approaches to innovation often restrict the ability of SMEs to innovate and attain competitiveness (Bianchi et al., 2010).

Recent studies regarding innovation technology management have proposed several potential benefits of the open innovation processes. Some have described a shift from traditional or closed innovation models with a primary focus on internal research and development (R&D) towards an open innovation approach (Chesbrough, 2003; Parida et al., 2012). Engaging open innovation actively uses and exploits the inward and outward transfer of knowledge and technologies (Chesbrough et al., 2003).

The current study focuses on the potential benefits of open innovation in the UK-based food SMEs. This area is new in the sense that it has not yet been the specific object of any published study.

Many scholars would agree that open innovation could be useful for both SMEs and large firms (Chesbrough, 2003; Chesbrough et al., 2006; Lichtenthaler, 2008a). However, earlier research concentrates on multinational organisations.

SMEs are different from large firms in terms of how they exploit open innovation activities for specific outcomes. SMEs face some inherent limitations, such as a lack of financial resources for R&D, unstructured innovative processes and underdeveloped internal capabilities
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(Chesbrough & Crowther, 2006; Lichtenthaler, 2008a; Madrid-Guijarro et al., 2009). Conversely, SMEs are usually less bureaucratic, more willing to take risks, and in positions of specialised knowledge. They tend to react quicker to change management activities, which enables them to be better than larger organisations at adopting open innovation (Christensen et al., 2005; Stam & Elfring, 2008). In addition, the most recent studies of open innovation (OI) in food and beverages merely focus on observations of the effects of open innovation on innovation. They disregard the drivers that encourage food and beverage firms to engage in open innovation activities. One possible solution to this would be to apply a two-step Heckman selection model. This would involve observing the motivation of the firm to adopt open innovation and examining the extent to which it is receptive to openness. It would then require an analysis of the effect of open innovation on organisational performance.

A Schumpeterian (1934) hypothesis postulates that prominent firms are more innovative because of economics of scale in research and development, and better technological knowledge and capabilities. Therefore, it can be said that the bigger the firm, the higher the probability of success. On the other hand, Stock et al. (2002) argued that SMEs are more innovative in comparison to large firms because of their entrepreneurial attitude, flexibility, dynamism and less bureaucratic management.

To date, innovation is increasingly acknowledged as one of the key factors behind organisational success. Innovation has also become of particular interest to the food industry, even though the extensive literature on this industry means it is usually considered as a sector defined by low research intensity (Christensen et al., 1996; Martinez & Briz, 2000). On the other hand, the food industry is considered one of the biggest manufacturing sectors within the European Union (EU) in terms of its contribution to both economic results and employment (Avermaete et al., 2002; Menrad, 2004; Traill & Meulenberg, 2002). A benchmark report on competitiveness by the European Confederation of the food and drink industry (CIAA) illustrates that innovative potential should be enhanced if firms are willing to remain competitive in the market in future (CIAA, 2008). The type of innovation introduced recently in the food industry has embraced scientific and technical approaches to food processing. Some studies illustrate that new food products are more successful than incremental innovations such as line extensions and me-too products that generate only short-term gains and low margin benefits (ECR Europe, 1999; Knox et al., 2001).

1.2 Theoretical Context

Understanding how to manage innovation successfully is significant at a time when change becomes a requisite survival strategy. At the same time, it is a risk-taking strategy because it can lead to organisational failure (Olleros, 1986; Tellis & Golder, 1996). Many innovation management studies are normative in nature and focus on how to innovate successfully. Given the fact that innovation management has changed over the last few decades, it seems that many companies have unique notions of what counts as success or best practice (Rothwell, 1994). However, historical divisions may have been accurate in past years, and modern innovation practices advocate that organisations do not automatically decide what best practices are, as prescribed by the dominant model of their time (Ortt & Van der Duin, 2008). In fact, innovation managers often decide the innovation process based on a context.

The term ‘Innovation’ is increasingly used in all fields of science. Innovation is increasingly recognised as making a significant contribution to organisational success, performance, and survival. Innovations vary significantly in their nature. Damanpour et al. (2009) advocate that the urgency of an organisation’s innovation management process is often determined by pressure from the external environment. These factors include competition, deregulation, isomorphism, scarce resources and customer demand (Baregheh et al., 2012; O’Keffe et al.,
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Damanpour (1996) defines innovation as a multifaceted construct that encompasses the generation, development, and implementation of an idea or behaviour which is new to the adopting organisation. Companies rarely innovate on their own, but instead tend to cooperate with agents (Bayona-Saez et al., 2017). Innovation processes are systematic and interactive. Research on the interactive process has increased following Chesbrough’s (2003) publication. There has been substantial colloquium apropos of the categorisation of innovation. Open innovation is a recognised example of innovation management in the business world. In addition, open innovation is one of the more recent innovation strategies in business management research. Chesbrough (2003) coined the term ‘Open Innovation’ to describe a shift in the innovation paradigm from closed or in-house R&D of new products to an open innovation model which is associated with internal and external ideas, knowledge and technologies to create and commercialise new products and services. Open innovation is described as ‘the use of purposive inflows and outflows of knowledge to accelerate internal innovation and expand markets for the external use of innovation’ (Chesbrough, 2003). Open innovation encompasses the most important changes to innovation activities, which can be characterised as more distributed, multidisciplinary, trans-border, cross-institutional and inter-temporal than those that were salient in the 20th century, which were confined to one conceptual framework (Bianchi et al., 2011; Chiaroni et al., 2011; Dahlander & Gann, 2010; Huizingh, 2011). This framework postulates that innovation is significantly achievable beyond R&D activities. Rather, innovation can be viewed as a consequence of the smart and targeted combined use and application of knowledge and competences with special emphasis on the willingness to integrate third party ‘knowledge and abilities into one organisation's activities’ (Vanhaverbeke & Cloodt, 2014).

In a broad sense, the main understanding of open innovation implies that innovations result from sharing competences between different players along and beyond the value chain, with implications for external relationships (Chesbrough, 2003; Chesbrough et al., 2006). It has long been assumed that open innovation was the preserve of larger organisations. A redefined open innovation definition is ‘open innovation is a distributed innovation process based on purposively managed knowledge flows across organisational boundaries, using both pecuniary and non-pecuniary mechanisms in line with the organisation’s business model’. This flow of knowledge may involve external knowledge sources through internal process, knowledge outflows from core organisations leveraging internal knowledge through external commercialisation processes and coupling external knowledge sources and commercialisation activities (Chesbrough, 2003a, 2006b; Gassmann & Enkel, 2004; Dahlander & Gann, 2010; West & Bogers, 2014).

Early research on open innovation mainly focused on the adoption of open innovation approaches and practices in large high-tech industries such as IBM (Chesbrough, 2003), Xerox, Addidas (Piller & Walcher, 2006) and Proctor & Gamble (Dodgson et al., 2006). These organisations managed innovation and new product development as internal processes, and profoundly depended on their own knowledge, R&D capacity and technology to develop new products in their own laboratories which represented significant strategic assets (Wynarczyk, 2013). The ‘closed innovation paradigm’ labelled by Chesbrough (2003) provided a considerable entry barrier for potential competitors, particularly small and medium-sized firms which typically retain competitive advantage and lead time in the marketplace (Teece, 1986). Subsequently, research advocates that open innovation strategies are also being practised in small and medium-sized firms (Bianchi et al., 2011; Lee et al., 2010; Van de Vrande et al., 2009; Wynarczyk, 2013). However, empirical studies on open innovation practices in small and medium-sized enterprises remain relatively scarce (Wynarczyk et al., 2013).
Innovation and technological modification are the essential sources of productivity growth, international competitiveness and proliferated living standards. In past years, these areas have become the focal points of growing attention due to relentless competition from rapidly emerging knowledge-based economies (Department for Business, Innovation and Skills, 2011; Talwar & Hancock, 2010). In particular, research and policy have begun to focus on SMEs as a fundamental source and driver of new product developments, innovation and new technologies (Wynarczyk & Piperopoulos, 2013). According to the latest report from the European Commission (2015/16), just under 23 million SMEs generated €3.9 trillion in value added and employed around 90 million people. Thus, innovative SMEs play a significant role in national and regional economic development and international competitiveness.

However, studies have demonstrated that only a small population of SMEs are responsible for most of the positive effects regarding innovation, new product development, R&D, exporting, creating employability and wealth creation (Nesta, 2009; Wynarczyk & Thwaites, 2000). Amongst such innovative firms, only a small number of SMEs have the desire, capacity and opportunity to successfully pursue growth, expansion and diversification beyond their local marketplace. In the current knowledge-based environment, fledging SMEs in particular are inhibited by both internal and external structural barriers such as smallness, management capabilities, skilled workers, financial stability and access to external knowledge. A report published by NESTA (2009) shows that only 6 per cent of SMEs with high growth rates created half of the new jobs in existing businesses between 2002 and 2008, and innovation has been involved in the competitiveness and growth of these businesses. The rationale for OI adaptation in practice by SMEs varies amongst large and multinational firms. This is due to the size of the firms as well as the extent of economic and financial gains and inter-firm relationships. On the other hand, investment in research and development is considered the primary driver of innovation and increased productivity. The contribution of R&D to company growth and economic development has been recognised by many scholars in the past. In particular, Cohen and Lavinthal (1990) regarded investment in internal R&D as a significant asset in evaluating and utilising external knowledge and technology.

However, it has been argued that British businesses are not research-intensive in comparison with other advanced countries all over the world (Wynarczyk, 2013). The previous year’s records evidence that investment in R&D and patenting has been relatively low. R&D, research and employment are mostly concentrated in a limited range of industrial sectors in UK businesses. A small proportion of large firms are located in more affluent areas of the country such as in the south-east. It has been estimated that over 80 per cent of total R&D expenditure is conducted by the one hundred most active firms (Wynarczyk, 2013). Conversely, independently owned SMEs account for only 3 per cent of total R&D expenditure in UK business. These are assumed to be amongst the most focal causes of the productivity gap that exists between the UK and other comparable economies (Sainsbury, 2007; R&D Scoreboard, 2009).

The potential issues of SMEs can be identified and solved. The main challenge for business support intermediaries and policymakers in the recent economic and financial crisis is to recognise and support those factors which are capable of ‘making a difference’ to promote firms with innovation and growth potential. It has been claimed that open innovation significantly helps SMEs to eradicate many boundaries such as location, technology and both internal financial and human resources. OI practice offers a different strategy through which growth-oriented SMEs can access inter-firm resources at low cost. It stands in the way of developing new products and entering into new markets (Chesbrough, 2003).
1.3 Managerial Implications and Conclusion
The food industry is considered one of the most significant industrial sectors of the global economy. It ranks highly in terms of employment, turnover, and value-added investment. The food processing industry was traditionally characterised as the most reluctant industry to embrace new technologies (Brasili & Fanfani, 2006).

From a historical perspective, the food processing industry has long been associated with low technology. In fact, R&D activities in the food industry are considered of secondary importance compared to other industrial sectors, for instance the chemical industry and the Information and Communication Technology (ICT) industry (Samadi, 2014).

Even though multinational food companies invest heavily in R&D, most large and multinational companies do not have the means to invest in modern laboratories and intensive research. Yet it is noticeable that the food industry has changed dramatically over the last decade. For instance, competition has been amplified in both national and international markets, and the industry has encountered a string of threats to food processing. Furthermore, a range of cultural and environmental issues have arisen in the food debate (Avermaete & Viaene, 2002).

Avermaete and Viaene (2002) suggest that the food industry should undertake innovative processes to improve product quality, expand consumer confidence and encourage modernisation. This will also lead to technological development, and stability in response to these changes. Higher standards of living combine with greater potential spending on commodities with higher added value, together with better packaging. Samadi (2014) suggests that these standards can be achieved through innovative management and technological development. Innovation is considered one of the primary determinants of success and long-term survival for companies in the food industry.

Mansfield (1995) stated that academic research has contributed to business innovation activities in various industries. Innovation is achieved through R&D, which is carried out by universities and research centres who apply efficient methods to production and supply in the food industry (Samadi, 2014). There is much pressure on universities to raise research funding to actively contribute to industrial innovation (Muscio et al., 2010).

Industrial policy depends a great deal on technology transfer as a tool for the development of knowledge-intensive economies and increased competitiveness (Bozeman, 2000). Despite having excellent innovation potential, the food industry is generally based on ‘redundant technologies’ (Muscio et al., 2010). SMEs are actively involved in the food industry and studies have indicated that SMEs adopt OI in practice due to the need for external resources that could help to develop and commercialise new products (Samadi, 2014). However, the industrial structure is generally composed of SMEs with low R&D capacity.

References:
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INFORMATION TECHNOLOGY CAPABILITY AND ORGANIZATIONAL AGILITY ON A HEALTH COMPANY

Abstract

This paper presents a case study relating IT Capability and Organizational Agility within a medical diagnostics company in Brazil. The objective was to identify how IT Capability affects Organizational Agility; therefore, a qualitative approach was adopted. The analysed company is one of the four biggest Brazilian companies in this sector, and it is the youngest of them. The data collection was based on interviews with twelve persons, including IT professionals, business professionals and IT supplier professionals. The relationship between these two concepts was analysed from the perspective of the company’s three main information systems. The sensing dimension of organizational agility has so much information from monitoring systems that the importance of reacting dimension is based more on the effectiveness of the projects than on the time of response. The study shows that IT capability supports the organizational agility on its both dimensions – sensing and reacting – and these are not separated nor unrelated dimensions. The organization responses are highly based on the analysis of the identified problem areas, and they bring insights and create a time advantage that allow the company to spend more time choosing the new projects that should be carried on. The reacting dimension of agility are not about time of response, but about the effectiveness of response.

Keywords: Information Technology Capability, Organizational Agility, Medical Diagnosis, Health Company

1.0 Introduction

This paper presents a study about the relationship between IT capability and organizational agility. IT Capability is a concept derived from the resource-based view theory (RBV). In the RBV perspective, IT Capability is seen as part of the IT organizational resources. It also helps to understand the relationship between IT investments and organizational performance, as there are several studies in the literature that present IT capability as an intervening agent of this relationship.(Bharadwaj, 2000; Chen, Wang, Nevo, et al., 2014; Huang, Ou, and Lin, 2006; Lu and Ramamurthy, 2011; Santhanam and Hartono, 2003).

Organizational agility refers to the company's ability to perceive changes in its environment and to generate responses to these changes. In a certain way, the concept of agility is close to flexibility. The difference, according to Teece, Pisano and Shuen (1997), is that flexibility is a way of responding to the risks that the company faces, and organizational agility is the appropriate way to deal with uncertainties. Risk refers to potential future events and their likely consequences. Uncertainty refers to unpredictable events whose nature and probability of occurrence are unknown (Teece
Therefore, organizational agility is more critical for organizations in environments of greater uncertainty. Several authors discuss about the relationship between organizational agility and business performance (Santhanam and Hartonos, 2003; Ray, Muhanna, and Barney, 2005; Jiao, Chang and Lu, 2008; Stoel and Muhanna, 2009; Lu and Ramamurthy, 2011; Mithas, Ramasubbu, and Sambamurthy, 2011; Chakravarty, Grewal, and Sambamurthy, 2013). Chen et al (2014) showed causal relationships between IT investment, IT capability, organizational agility and business performance, and the role of agility organization are mediated by environmental characteristics.

The focus of this work is the relationship between IT capability and organizational agility since the other two relationships (between IT investment and IT capability and between organizational agility and business performance) have been exhaustive studied and verified.

Differently from most of the previous studies in the literature, this article uses a qualitative approach to evaluate this relationship because its focus is not on the existence or not of the relation (IT capability $\rightarrow$ organizational agility), but in on "how" this relationship occurs.

Wade and Hulland (2004) cite authors who have found a negative relationship between IT and organizational performance (Sager, 1988; Venkatraman and Zaheer, 1990; Warner, 1987). This suggests that the nature of this relationship and its stakeholders are not yet clearly specified in the literature. That is the reason why this study opted for the qualitative approach based on a case study.

The case approached in this study is a Brazilian medical diagnosis company founded in 2011 by an investment group (Fundo Pátria) that executes an aggressive strategy of acquisition of regional brands and has quickly become one of the four largest medical diagnostic groups in Brazil. Its operation is strongly based on the management of operational information that flows through interfaces with three main actors: health care providers, doctors and patients. The observed data suggest that some of the dimensions of IT capability, manifested in key IT applications, support the development of key competencies for organizational agility. The obtained advantage of perceived capability has made its reaction dimension more linked to the effectiveness of actions (operational improvement projects and development of new products) than to the speed of reaction.
2.0 Literature Review

Bharadwaj (2000) used Resource-Based View Theory RBV to study how IT affects the performance of companies and created the term IT capability. She used CIO assessment provided by IT professionals from other companies as an indicator of IT capability. In companies with greater IT capability, the financial indicators analysed were higher than those of companies with lower IT capability. This is a considerable limited operationalization of IT capability concept since it be should be an organizational and non-personal characteristic. Later Santhanam and Hartono (2003) employed the same operationalization of IT capability and obtained conclusions consistent with the work of Bharadwaj (2000), and a recommendation is made about the need of indicators for the dimensions of IT capability as a way to evolve the research in this area – the relationship between IT investment and organizational performance. Several researchers have presented different scales for the dimensions of the IT capability (Chen et al, 2014; Mithas, Ramasubbu & Sambamurthy, 2011; Jiao, Chang & Lu, 2009; Gao, Chen & Fang, 2009; Chakravarty, Grewal & Sambamurthy, 2013; Huang, Ou, Chen & Lin, 2006; Bhatt & Grover, 2005; Tippins & Sohi, 2003; Pérez-López & Alegre, 2012; Lu & Ramamurthy, 2011; Stoel & Muhanna, 2009; Wade & Hulland, 2004; Piccoli & Ives, 2005). All these quantitative studies found a positive relation between IT capability and organizational performance.

Overby, Bharadwaj and Sambamurthy (2006) contributed to a better understanding of this relationship when proposed the concept of organizational agility to mediate the relationship between IT capability and organizational performance. According those authors, in most organizations the main impacts of IT on the business occur indirectly across business areas and processes, and IT would play an important role in redesigning and deploying business processes. According to these authors, agility has two dimensions – sensing and responding that extend the reach and richness of the company's knowledge and processes.

The sensing dimension is related with knowledge management and environmental scanning, refers to the intellectual ability to find appropriated opportunities; and the responding dimension is related with to supply chain management, production management and resource usage, and the ability to act properly. In addition to the direct impact that IT has on organizational agility, there is also an indirect impact through the creation of digital options (Overby et al, 2006).
Sambamurthy et al (2003) suggest that IT indirectly supports agility by providing companies with digital options, which are defined as a set of IT-enabled capabilities in the form of work processes and knowledge systems. A basic premise of this theory is that IT increases the breadth of reach and the richness of information that is available to the company, enhancing its ability to perceive and respond to the environment, thus making it more agile. The term "options" is used because a company can apply its IT-related capabilities to emerging opportunities, or it can remain unusable, depending on the company's environment and strategy. These authors define three types of IT agility (dimensions): customer agility, partner agility and operational agility.

Customer agility is the ability of the company to utilize customers in exploration and exploitation of innovation opportunities. It refers to the company's ability to understand customer manifestations to gain market intelligence and detecting opportunities. Partner agility is the ability to mobilize the organization resources, and the knowledge and skills of suppliers, distributors, contracted manufacturers and logistics providers, through alliances, partnerships. It enables companies to build a network of strategic partnerships to explore innovation opportunities and create competitive advantage. Operational agility refers to the ability of the business processes of companies to achieve competitive standards of time, cost and quality for the exploration of innovation opportunities and the creation of competitive advantage. This dimension allows the company to quickly redesign existing processes and create new processes to exploit the conditions of a dynamic market. Table 1 shows dimensions of organizational agility used in different papers.

In general, the researches that study the relationship between IT capability and organizational agility take a quantitative approach from a positivist perspective. These previous study were important to identify the relationship between these concepts, and relations with other concepts, such as organizational performance, environmental characteristics and IT investment. However, because of the methodological approach adopted, they did a limited contribution to the understanding of the mechanisms underlying these relationships.

The literature shows that there is a relationship between the concepts studied here – IT capability and organizational agility. These previous researches are mainly from quantitative nature and focused on statistical evidences of this relation. As the interest
of this study is to identify how this relationship occurs, we chose a qualitative approach based on a case study.

<table>
<thead>
<tr>
<th>Authors</th>
<th>Analysis technique</th>
<th>Dimensions of Organizational Agility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sambamurthy, Bharadwaj and Grover, 2003</td>
<td>Theoretical review</td>
<td>Customer agility</td>
</tr>
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<td></td>
<td></td>
<td>Partnering agility</td>
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<td></td>
<td></td>
<td>Operational agility</td>
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<tr>
<td>Tallon and Pinsonneault, 2011</td>
<td>Structural equations modelling</td>
<td>Unidimensional concept</td>
</tr>
<tr>
<td>Chakravarty, Grewal and Sambamurthy, 2013</td>
<td>Latent class regression analysis (CLCRA)</td>
<td>Adaptive agility: the company’s ability to detect and respond to the market in a defensive way. Usually as an attempt to recover from disturbances in market forces. Entrepreneurial agility: the ability to organize the business processes in order to catch potential opportunities.</td>
</tr>
<tr>
<td>Lu and Ramamurthy, 2011</td>
<td>Regression analysis</td>
<td>Market capitalizing: the company's ability to continuous monitoring and rapidly deliver product / service improvements in order to meet customer needs. Operational adjustment: is the ability to adjust business processes to quickly responding the market changes.</td>
</tr>
<tr>
<td>Fink and Neumann, 2007</td>
<td>Structural equations modelling (covariance-based)</td>
<td>System Agility: the ability to perform changes in information systems efficiently (in terms of cost and time). Information Agility: the ability to perform changes in the way users access and use information resources. Strategic Agility: the ability of efficiently and effectively responding the emerging market opportunities by leveraging existing IT capabilities.</td>
</tr>
<tr>
<td>Richardson, Kettinger, Banks and Quintana, 2014</td>
<td>Longitudinal case study</td>
<td>Customer agility</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Partnering agility</td>
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<td>Operational agility</td>
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</tbody>
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Table 1. Previous studies about organizational agility

3.0  Research Method

In order to better understand the reaction between IT capability and organizational agility a qualitative approach was chosen. A case study was performed at Alliar, a diagnosis company that has few local brands around Brazil. Its operation is strongly based on management of operational information. This information has been processed by some applications that has created strategical advantages. Despite Allier be a very young company, it is one of the four biggest Brazilian companies its sector.
One characteristic that distinguishes this company from the others in the market is the fact that its operation is strongly based on a set of information systems that allow a high standardization of processes across the various units and a centralized monitoring of operations at the company headquarters.

The access to the case was granted by the company’s CIO who is also the COO. The fact of same person occupies this two positions illustrated the importance of IT management in this company.

We conducted 14 interviews with 12 individuals in a two stages process (Table 2). The first staged aimed to obtain an overview of the company, its operation and the role of IT. The CIO was the first interviewed. He talked about the company structure, its strategy and the IT role. He indicated other six people to interview: three from IT operations and three on business areas. From IT area, the first interviewed was IT Infrastructure Manager who is responsible for design and operation of IT infrastructure. The second one was the IT Applications Manager who conducts the specification, design, development and implementation of new IT applications. As the company outsources all software development, the third interviewed was manager from a system supplier. From business area, the CFO and the CMO of the company were interviewed, and a unit manager who is responsible for one of the group's brands.

The results of this first stage was discussed with the CIO. It was identified three system that have affected stronger the organization. In order to understand the impacts of each of this three systems, another stage of interviews were performed. The CIO indicated six persons (two for each system) who had participated of the system implementation. The identified applications were 1) command centre, 2) online monitoring of clinic operations and (3) billing system. Six people were interviewed, two for each system.

The data collected data (interview’s speech) was transcribed, and analysed using descriptive coding (Saldaña, 2009).

<table>
<thead>
<tr>
<th>Individual</th>
<th>Position</th>
<th>Stage 1</th>
<th>Stage 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. CIO</td>
<td>CIO – Chief Information Officer / COO – Chief Operating Officer</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>2. IT_Supp</td>
<td>IT Supplier</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>3. CMO</td>
<td>CMO – Chief Marketing Officer</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>4. U_Mgmt</td>
<td>Financial Manager of one of the group's brands</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
5. CFO  CFO – Chief Financial Officer  X
6. IT_App  IT Applications Manager  X  (ii) online monitoring
7. IT_Infra  IT Infrastructure Manager  X
8. Proc_Mgmt  Process Management  (ii) online monitoring
9. CC1  Command Centre  (i) command centre
10. CC2  Command Centre  (i) command centre
11. Bill_1  Billing  (iii) billing system
12. Bill_2  Billing  (iii) billing system

| Table 2. | Interviewed people |

### 4.0 The Case

Alliar was founded in 2011 by an investment fund – Fundo Pátria – that saw an attractive opportunity in the sector. Despite some ups and downs, Brazil has shown a rising income trend and a middle class expansion. On the other hand, the bankruptcy of the public health system, as well as the social security system, creates an expectation of expansion of private health services. Alliar's growth strategy was the acquisition of regional brands. These regional brands maintain their local identity, the former owners also become minority shareholders of Alliar, but they had to adopt and to use the group's processes and practices.

Figure 1 shows the geographical distribution of these local brands. The State of São Paulo is the main state of Brazil and it is where the biggest part of the operation is located.

![Figure 1. The local brands of Alliar on Brazil.](image-url)
Figure 2 shows the structure of Alliar market. It is one of the four biggest diagnostic medical companies in Brazil, and also the youngest. The second youngest company was created 30 years ago. Therefore, it is natural that it has adopted routines that are not usual elsewhere. The main interactions in this sector involve four actors’ groups: competitors (other medical diagnosing companies), health care providers, doctors and patients. The state regulates all these interactions to some degree. The first interaction refers to the patients that buy health support services from health care providers. There are many providers offering different contracts for the population. These providers have high a level of influence on government decision and are the strongest branch of the chain. They have enough power to impose, within legal limits, the price patients pay for health care support, and the values they pay to their suppliers: medical and diagnostic services.

When a patient has a health problem, the patient schedules an appointment with a doctor who is authorized by the patient’s health care provider. The doctor requests the patient to execute a medical diagnosis examination, and the patient goes to a medical diagnostic clinic to perform the examination. The health care provider pays the doctor and the clinic for their services. Therefore, Alliar has interactions with three groups. The health care providers pay Alliar; negotiate for cost reduction and create different rules for billing services. The medical doctors should not dictate where the patients must execute their examinations, but they actually select the clinics and fulfil Alliar’s demand. The third group are the patients, and interactions with them determine Alliar’s operational costs.

In order to be competitive, Alliar and its local brands must manage their relationships with these three groups – doctors, patients and healthcare providers. The company must follow the contractual guidelines with the health care providers. It is a very complex process since the rules vary across providers, type of clients of the same provider, and examination clinics. It is very important to follow contractual rules to avoid the risk of not being paid for services performed, or payment delay. Alliar must also deliver high quality medical exams, with good data analysis and specialized medical reports to support the diagnosis request made by medical doctor. The medical doctors’ dissatisfaction affects the Alliar demand, so the company invests on technological updates through better equipment, professionals and protocols. The perception of patient service quality is mainly based on time spent to schedule the examination, time spent in the clinic, and lead-time to deliver examination results.
IS applications and IT management are designed to improve relationships with these groups by: (i) reducing the payment delay of health care providers; (ii) stimulating the demand for exams created by doctors; and (iii) reducing the operational cost of patient examinations.

After the first round of interviews, the preliminary data analysis was shared with the CIO. Three information systems were selected to be analysed. All the applications selected had high impact on Alliar’s performance. The analysis focused on the relationship between IT capability and organizational agility. The systems chosen were: 1) command centre, 2) billing system, and 3) online monitoring of the clinic’s operation. They are presented in details in the next sections.

4.1 Command centre
The Command Centre (CC) is an operation centre for magnetic resonance imaging. It is located in a larger city that operates equipment installed in smaller cities. IT support for the operation of a Command Centre can be divided into three tiers: 1) remote operation of the resonance equipment, 2) chat, audio and video communication with the local operator and the patient being examined, and 3) communication network that supports the two previous layers.

Initially, the Command Centre’s main objective was to reduce costs, because there is constant and intense pressure from health care providers and from the major shareholder of Alliar, the investment fund. The labour cost per unit would be reduced, and the cost of skilled labour in the CC would be higher; but with a higher output, the
average unit cost of the exams would decrease. This happened because processes were reviewed so that the most qualified technician, who carries out the examination in the CC, is dedicated exclusively to the examinations, and other low cost professionals perform the peripheral activities, such as onsite patient reception, orientation and their positioning on the equipment. Other gains have emerged as well, such as an improvement in the quality of the exam, since the senior technician is dedicated only to the core activities of the exam, which reduces the need for patient return and leads to an increase in equipment availability and an increase in the number of examinations performed.

The creation of CC generated a scale of examinations for a group of radiologists, which brought an increase of examination diversity and protocols. In order to control this diversity, the company decided to review and standardize the protocols, and invest in the qualification of generalist technicians, i.e., professionals capable of performing different examinations with different equipment.

Complex examinations requires modern equipment and well qualified radiologists. This professional profile is often not available in smaller cities, but the modern equipment is. Thus, the very skilled professional of CC can expand the range of examinations offered at local units up to the technical limits of available equipment. From this point of view, there were improvements for the patient, who can be examined at a site closer to their location, and for the medical specialists who now have a greater variety of examination equipment to support their diagnoses.

The CC is a platform for standardization and modernization of resonance examination protocols, which has a direct impact on the quality of service and operational cost. This better quality affects the relationship with doctors who request the examinations and with doctors who report the exam [results]. This higher quality also helps with reduction of costs, which directly affect the relationship with the health care providers who pay for the exams performed.

It is possible to note that values such as quality and operational efficiency are results of the pressure of the health care providers to reduce service prices, and the pressure of the Fundo Patria for increased results. It creates a culture of innovation based on 1) dissemination of best practices; 2) encouraging the personal development of brand professionals in Alliar’s projects; and 3) innovation improvement projects such as service development and process operational efficiency.
The doctors who review the examinations are key stakeholders in this application, and it was designed in order for them to have a positive perception of the application. These doctors are former owners of the brands that were bought and they became minor shareholders of Alliar. In addition, they are prominent people in the local community and act as commercial branding agents with the doctors (who request examination) in their area. Thus, instead of bringing more qualified professionals, actions were taken to improve the profiles of these physicians. For instance, standardization and modernisation of protocols with the participation of the best experts in the group, along with general training of physicians was provided. Social media groups (WhatsApp) were created where physicians exchanged information about specific cases. This is an example of socialization of knowledge. In central terms, it generates an improvement of protocols that is an example of the internalization of knowledge.

4.2 Billing system

The performance of the billing function depends on the schedule of income payments described by the agreement with the health care providers for all the examinations carried out in the period. This is a very complex task due to the wide variety of processes associated with it. Each health care provider has different plans, each plan covers a set of examinations, and each examination has its own authorization process. Thus, the way an examination’s request is processed in the company depends on the patient health plan (provider and health plan). In addition, billing rules vary across health care providers: Some are billed once per month, twice billed a month, or once a week.

The company may be subject to not receive the amounts invoiced for two types of errors: 1) it does not perform the process as agreed with the operator, and it generates a gloss, and 2) performs an uncovered examination. The latter generates a loss; the first generates a delay in receiving payment. To reduce these errors, Alliar has invested in the operating support system (called Pleris) that registers all the rules negotiated with each health care provider (and with each operator's plan). This prevents scheduling an examination that is not covered by the plan and/or conducting an examination without the formal provider's authorization. Because the authorization process varies among health care providers, the company has used robots to automate
this process. Thus, billing success is closely linked with operation automation (Pleris system) that focuses on efficiency: reducing errors and reducing deadlines.

The billing gloss happens when the provider does not pay part of the examinations performed (and invoiced) in the period. The effort has been on two fronts: to identify the causes of the gloss (ability to perceive organizational agility) and to reduce the time it takes to receive the tests performed (organizational agility).

When the health care provider makes the payment, it displays which exams were paid and which ones were not. Due to the volume of exams, the process of identifying unpaid exams (glosses) would be very labour intensive without IT help. In addition, it is necessary to analyse these examination in order to identify the causes of the gloss to 1) solve it and 2) identify its root causes so that they do not recur in the future. In this sense, the integrated billing system with the operating support system (Pleris) is critical. The quick treatment of the gloss brings a reduction in the receipt term, which reduces cash flow and increases the profitability of the company. The identification of systemic causes of gloss leads to changes in processes and information systems that also improve financial performance.

The billing system has also supported negotiation with health care providers. Basically, it helps to simulate the financial impact of billing rule changes with health plans. If Alliar requests to send invoices more frequently, the provider will ask for a longer payment period. Thus, this system has helped Alliar to receive the highest possible percentage of the billed amounts, and to receive the billed amounts in the shortest period possible.

4.3 **Online monitoring of the clinic’s operation.**

This application monitors the operation of three major stages in the operation of Alliar clinics: reception, technical assistance and delivery of exams. It is an application that captures data from transactional systems and synthesises them in a large panel, in which everyone can see the operation of the group's clinics. It is an operation monitoring system and it is fundamental to identify operational problems. The identified problems are separated into two groups: punctual and structural. Punctual issues, or initially classified as such, are sent to the operational team to be reviewed and solved. The structural problems show trends and they are analysed by the process management engineer. Eventually, this starts a new operational improvement project that implies some system change.
Even when there is no chronic problem to be solved, there is still pressure for operational improvement. This pressure comes from two sources. The first is the relationship with health care providers who are pushing for price reductions (or updating values below inflation) of the services performed. The second comes from the investment fund that is a majority shareholder of Alliar; this majority shareholder asks for constant performance improvements that is also reflected in efforts to reduce costs through operational efficiency.

From the point of view of organizational agility, this application mainly contributes to the organization's perception ability.

The reaction capacity is less tied to the reaction speed, and more linked to the effectiveness of the reaction. The improvement projects involve a process of study and analysis of the situation that involves individuals from Alliar, people who work at Alliar’s clinics (different brands) and people from the its suppliers also. Apparently, this is not a problem, since monitoring (perception) gives an advantage over competition that allows Alliar to spend more time evaluating the available action alternatives. This process is performed by a process development staff who interview and operation’s workers, and goes to the operational areas to monitor the patient’s attendance. They also construct pilot applications and tests them on selected units.

4.4 Conclusions about studied IS applications

We did not find any IT infrastructure features that are unique in the organization, as it works with software packages provided by external suppliers over which t small customizations were made.

All the Alliar’s systems are based on a web platform that creates a unique structure for all brands of the group. This facilitates the standardization of the operation in all units (of all brands), the comparison of results, the identification of the best areas and the identification of bottlenecks. However, this architecture, which does not seem to exist in some of the competitors, does not constitute a sustainable advantage since it is a well-established technology in many sectors. Thus, the IT resources that support organizational agility should be others.

First, there is a partnership between the process management and IT groups. These elements are highly interrelated: Process developments generate changes in information systems, and changes in information systems generate changes in
processes. Inside new projects, people from these two functions work together and it is difficult to identify who is the trigger of the changes. There is also the use of existing expertise in brands. Individuals who possess a knowledge considered distinctive and important to the group are invited to participate in projects to diffuse this knowledge as process change and systems implementation in other brands of the group. These people have a double assignment. They maintain their responsibilities in their units of origin (even with a reduction of workload and journey) that may be out of the city of São Paulo, and begin to participate in projects of the Alliar group that can be conducted, even temporarily, in another city. The individual motivation of these employees is not linked to an increase in income or hierarchical change. Apparently, they are inventive people who like to get involved with improvement actions. Alliar seeks people with this profile for the activities at headquarters. Perhaps the proximity to the centre of power and decision, and the recognition of expertise by top managers are a sufficient compensation for them.

Someone can see these arguments from the point of view of knowledge management. Explicit knowledge is managed by the integration of IT staff and process management, and tacit knowledge is managed by the participation of the most outstanding employees (experts) in the group's deployment projects.

An important aspect of project management is the continuous efforts to achieve its goals, even with changing paths. The web check-in project is an illustrative example. The company decided to apply a workflow in the clinics similar to that of airline companies. Similarly, this would eliminate the patient's time of reception at the clinic and the patient would go directly into the examination area ("boarding area"). Apparently, people are more confident in interacting with an airline application than in a laboratory where the examinations involve less commonly used names. The low adherence of the pilot project did not lead to the abandonment of the idea, but to the revision of the design of processes and support systems. In the new version, information about patient and examination will be obtained by the system and no longer informed by the user.

Two points must be highlighted in this example. The first is the certainty that the idea must be pursued despite the initial difficulties. This is due to the process of analysing the situation and choosing the available alternatives of action. This reinforces that the effectiveness of the reaction seems to be more important than the speed of response. The other point that also appears in this example is the automation of tasks involving
less qualified personnel (clinic reception area). The role of IT applications here is to eliminate costs (reduction of labour involved and time of operation).

Alliar is a young company, compared to competitors, and its history is unique. It was not created by doctors, but by investors. This explains why certain behaviours happen. The company appears to be much more open to absorbing practices from other sectors, especially industry / manufacturing, such as process review and standardization, operation monitoring, idle identification, and bottlenecks.

5.0 Final Remarks

Alliar interacts with different type of actors. The investment fund (Fundo Pátria) is its main shareholder and aims increasing profitability from its operation. This pressure produces internal changes such as process and products revisions, and improvements on the relationship with other actors. Alliar´s income came from health care providers and the company tries to reduce the gloss (increase the income) and reduce the time of receipt. The third actors are the doctors who order examinations for patients. They want examination availability in their region and high quality services (e.g., updated protocols and high image quality). The last group are the patients who want to be readily attended.

The three IT systems analysed here cover these actors’ relationships. The billing system is focused on maximising the income while simultaneously reducing the gloss and the time to be paid. The command centre offered the most modern examinations at locations where communities did not have specialized professionals to perform the exams. It also reduced the unitary cost of these services, and acted as a centre of development for best protocols that improved the overall quality of the service. The online monitoring application allowed identification of the limitations and bottlenecks of the operation. The comparisons among units generated data to define improvement process projects that were focused on cost reduction. In a simplistic way, for the operations that involved highly qualified technicians, IT was being used to improve the professional skills and the service quality. At operations with less-skilled professionals, IT was used as an automation tool to reduce and eliminate human interaction.

The importance of IT resources to IT capability are not the same. We did not find any distinctive aspect of IT infrastructure. Alliar uses mainly software packages that can
be easily copied by its competitors. There is no big technical competence of its IT personnel. The main aspects are the management competence of IT personnel and shared values that are intangible assets.

There is an influx of the culture of appropriation of best practices and ideas, both internal and external. The concept of a command centre came from one newly acquired brand, and the idea of a new non-proprietary application for remote operations of the resonance equipment also came from another brand. The company also tried to incorporate solutions from other industries, such as web check-in projects from airline companies. There is an intern environment stimulates the participation on improvements projects, not just workers from Alliar central office, but also people from local brands. This participation creates process changes that improve the quality of services (as it was seen with the command centre), and reduce cost, as it was demonstrated by the changes in processes monitored by the online system.

In a project, the IT professionals must manage the business knowledge of Alliar professional and the IT technical expertise of IT suppliers. IT professionals must identify and recruit inside Alliar the best personnel for projects, and manage the heterogeneous team formed.

The applications created support the organizational agility on both of its dimensions: sensing and reacting. The billing system and online monitoring system are applications to monitor the internal operations, the behaviour of doctors, and the payment of healthcare providers. They are used not just to identify local deviations, but also to identify opportunities for improvement. Therefore, sensing and reacting are not separated and unrelated dimensions. The reactions are highly based on the analysis of the identified problem areas. Alliar has much more information about its operations than its competitors have. It creates a time advantage that allows the company to spend more time choosing what projects should be implemented. Alliar is determined to see that your improvement project portfolio is well designed. The reacting dimension of organizational agility is not about the time of response, but about the effectiveness of response. The projects are divided into stages and, even under high uncertainty, it is possible to change direction and still achieve their primary objective.

On the opposite side, research by Teece (2016) suggested that there was no conflict found between operational efficient and flexibility – a concept related to agility. The
rules of different healthcare providers are stored in Alliar’s transactional system. Therefore, it is able to operate from different rules for different patients at same time.

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References


IMPACT OF PERSONAL IDENTITY MANAGEMENT IN E-GOVERNMENT ON CORRUPTION AND GOVERNMENT-CITIZENS RELATIONSHIPS

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Abstract

E-Government initiatives like Personal Identity Management (PIM) promises great prospects in many developing countries including Pakistan. However, there are many significant challenges to be faced yet. It has been observed that many e-government initiatives like establishment of e-government directorate, Computer training courses to government employees and IT wing at Establishment Division failed because of unsatisfactory preparation and political shakiness. At governmental level, there is realization that e-Government initiatives like PIM at National Database Registration Authority (NADRA) may provide customer-focused, cost effective and easy to use services for citizens and businesses, and have potential to bring betterment in the internal workings of government. This quantitative research was conducted using a structured questionnaire amongst 200 respondents and explores the perceived role of e-Government initiative like that of PIM in determining government-citizens’ relationship and reducing corruption. The results of the study support the hypothesis that e-Government initiative is positively related to improved government-citizen relationships and corruption reduction. The research also proposes that while e-Government initiatives (NADRA-PIM) can make notable contributions in bringing improvement in public services but they can best do in enhancing by and large relationships between governments and citizens.

Keywords: E-government, Personal Identity Management, government-citizens relationship, corruption reduction, National Database Registration Authority

1. Introduction

Identity management now constitutes the core concept of many governments all over the world in service delivery to its citizens. Traditional systems of identity management are being replaced with digital identity management by the governments, as the governments are now expanding its tentacles of e-government, more particularly in transactional area of service delivery to its citizens (EU Ministerial E–Government Declaration, 2005). Personal Identity Management System (PIMS) has been defined as following:

“The set of business processes and a supporting infrastructure for the creation, maintenance, and use of digital identities” (J Lewis- Burton group, 2003 in; Scorer, 2007, p.43).

In Countries like USA, Canada and UK, the permeation of Information and Communication Technologies (ICT) into the governmental functions has considerably changed the working of these governmental Institutions. Extensive Web presence, deployment of digital data capturing
techniques, the provision of governmental services to the general public has become instant, reliable, transparent and most particularly easier. In UK, efforts have been made where Personal Identity Management system may provide the basis for future realization of E-government. Currently individuals are holding different identities for set of varied services both for interaction with government and private sector in UK, Australia, Hong Kong, Singapore, Austria and Ireland (Greenwood, 2007).

Though it may not be source of concern for both citizens and governments, but it is a matter of inconvenience in terms of managing different identities. In UK efforts have been made to bring the system where individuals may be uniquely identified and this huge database may be used for provision of various services to the citizens. Few Socio-technical problems like that of data security and privacy of personal information may hamper its implementation and are extensively being discussed.

E-government semblance in a country like Pakistan has manifested itself with initiation of Personal Identity management through National Database Registration Authority (NADRA). NADRA being a government entity, is completely responsible for issuance of Computerized National Identity Cards (CNIC), has introduced some e-government initiatives which materialized its benefits of reduced corruption and improvement of citizens-government relationship to great extent through its various services of ID issuance, verification of data and utility bill payments. There exists a strong nexus between National identity management and e-governance, both are intertwined with each other so much so that without realization of importance of ICT at governmental level, the concept of national identity management is not possible and without having an effective and efficient identity management system, actualization of “E-governance” phenomenon looks distant dream. The world is convinced of the fact that the quality of public sector governance has a direct relationship with increased economic opportunities and effective and efficient delivery of services to the citizens (Mairead, Martein and Richard, 2008).

According to Rick Webb (2006), Accenture’s Chief Technology Officer for state and local government, Citizens today want better, faster and lower-cost services from government and there’s a tremendous demand to accomplish this objective. Citizens have become accustomed to do things online, like banking and buying products and they are expecting the same level of services from their governments that they are getting in the private sector. Therefore provision of services through a concept of e-governance is no more a choice but a demand on the governments.
The increasing role of electronic data capturing system at different levels and in different organizations has led to the creation of information society which entails that individuals be uniquely identified. This factor has utmost importance in the concatenation of procedures of authentication, identification and enrolment within the emerging trends of e-government, e-business phenomenon and more particularly in future implementation of e-democracy systems (Beynon and Davies, 2007). The perpetual engagement of an individual with multiple electronic services in public, private and voluntary sectors often led to the accumulation of varied nature of different electronic identifiers for each service and ultimately possession of physical tokens in the shape of credit cards, debit cards and driving license etc. by the individual. This issue of multiple identities has caused considerable inconvenience both for the individual and for the organizations resultantly, wastage of resources, duplication of efforts and colossal problem of identity management in the information society (Clarke, 1994).

In the context of identity management one such effort is underway in UK which foresees the implementation of an identity management system where individuals will be uniquely identified and they will be issued “entitlement cards”. The unfolding of such a scheme will lead to opening of some pragmatic socio-technical issues e.g. centrality of database, data hacking, safe custody of personal data etc that may impede the implementation of such projects. According to Beynon and Castells (1996), information society giving a legal cover to identity management by the government has some potential benefits both for the organizations and individuals but it also poses some serious threats and challenges of data protection, data privacy and more particularly the public confidence in information governance by the UK government.

NADRA through its personal identity management system i.e. deployment of online application for capturing digital data of the citizens of Pakistan to provide services to other governmental, semi-governmental organizations, private businesses and institutes, it has spread its tentacles in varied areas like e-toll for National Highway Authority (NHA), Arms license for Ministry of Interior (MOI), distribution of government funds for Benazir Income Support Program (BISP) to poor people of Pakistan, Automated Border Control (ABC) with the involvement of Federal Investigation Authority (FIA), management of Internally Displaced Persons (IDPs) due to war on terror, Provisions of funds to flood victims, verification services to both government institutions and private citizens through Verisys using SMS, helping out in launching Machine Readable
Passport (MRP), and last but not the least, Computerization of Electoral List for future realization of e-democracy in Pakistan.

Initially, in 1990, NADRA, Immigration and Passport (IMPASS) and Electronic Government Directorate (EGD) were brought into existence to achieve the objective of e-government in Pakistan. The study’s major focus was to discover level of e-government benefits like that of reduction in corruption and enhancement in government-Citizen relations by implementation personal Identity Management system has been achieved. If we delineate these objectives in straight lines following three objectives are explicitly surfaced.

a. To identify the role of Personal Identity Management System in realization of E-government in Pakistan?

b. To identify the impact of Personal Identity Management on reduction of Corruption?

c. To understand the role of Personal Identity Management in Government-citizens Relationship?

2. Literature Review

According to Clarke (1988) personal identity have the connotation of personality, a single entity and individualism, where as identification refers to the process by which individuals are uniquely identified. Moreover, in information system the rationale of identification process is association of torrent of data with a particular human being (Clarke, 1988). In information society personal identity management revolves around three inter-related processes of authentication, identification and enrolment which formed the basis for initiation of e-business and e-government in any country. The process of personal identity management itself is not free of socio-technical issues which confronts and challenge its purposiveness, effectiveness and data protection ability. With the growth and advancement in information and communication technology (ICT), individuals in a society may take on different identifiers due to their involvement in multiple electronic services offered by public and private organizations (Beynon et al., 2007). This phenomenon of multiple identities for single human being often overstrains the individuals and as well as the organizations in the information society. Uniqueness in identification is critical to the success of information system as the individuals have to interact with various forms of governance structure (Thompson, 2003). According to Checkland (1999), this effort on the part of government (UK) to provide legitimacy to electronic identity will certainly arise some potential issues regarding data protection
and data privacy. In a rush to forming of e-government, more often it happens that government becomes more techno-centric than governance-centric and by this way they lost the vision of good governance (Leitner, 2003).

However, constitution of e-government is far ahead of just inclusion of technology in the government processes rather it includes much of the socio-economic novelties and politico-administrative somersaults based on ICT infrastructure and developments. Thus to achieve meaningful advancement in efficient public service delivery, governments should avoid any technical biases and should rely on strengthening personal identity management infrastructure (Lietner, 2003).

The following graph which was adopted from the work of Hodgkinson (2002) shows how governments take initiative for use of technology in their day to day affairs and transforms from online government to e-government concept.

**Fig. 1. E-Government Maturity Diagram**

Excellence in e-government demands that efforts are to be effectiveness-driven and not merely have efficiency-focus. This will require the initiative to be led by good governance motivated by goal/purposes and additionally, these schemes must be outcome-focused. We must also recognize that government is a service business and it is the most diverse service business in the world. Information Technology only helps governments achieving excellence in their services as it does in the private sector (Beynon et al., 2007).

The need for personal Identity Management(PIM) system-E-government in the public sector has therefore been recognized by both 1) individuals and 2) the governments alike; for the one faced
with the challenge of ‘doing more with less’ while the other has an increased demand to adapt and provide specialized solutions. This means a ‘big change’ is on its way which will change the customary way of conducting the governments’ business by removing or minimizing redundancies, delays and corruption (Aldona, 2006).

As a popular term used in the development sector ‘good governance’ refers to the process of decision-making and the process by which decisions are implemented (or not implemented). Bad governance on the other hand is being increasingly regarded as one of the root causes of all evils within our societies (UNESCAP’s report).

Every country has some form of governance and the journey from legacy systems to an integrated Personal identity management (PIM) System is just like moving to the concept of New Public Management i.e. governance to e-governance. This is where the performance monitoring and measurement of the public sector has become very critical. As per the report on good governance by Centre for Civil Society, India, the output is more important than the process. The current administrative setup does exactly the opposite. It lays emphasis on procedure and has little regard to the output (http://go.worldbank.org/10.08.2011:23:11). A PIM system that not only automates the work flow but provides control on measuring key performance indicators is pivotal to New Public Management.

With personal Identity Management (PIM) system support, e-government achieves all the major characteristics of good governance vis-à-vis participatory, consensus oriented, accountable, transparent, responsive, effective and efficient, equitable and inclusive and follows the rule of law. It assures that corruption is minimized, the views of minorities are taken into account and that the voices of the most vulnerable in society are heard in decision-making. It is also responsive to the present and future needs of society (Aldona etal). Although some of the advanced countries have come close to it but it is commonly believed that good governance is an ideal and is difficult to achieve in its totality (Ogden and Richards, 1923).

Maureen A. Pirog & Craig L. Johnson in a case based study emphasized the significance of the government’s humanitarian services by employing latest digital technologies of Electronic Fund Transfer (EFT) and Electronic Benefit Transfer (EBT) for implementation of future strategy in normal as well as emergency relief. The use of digital technologies like that of EFT and EBT will to greater extent materialize the concept of lean and responsive government. Use of digital technologies for unique identification, meaning full cooperation among different sectors in
government as well as non-government actors will play significant role in the success of these digital technologies and ultimately an efficient and effective government.

Toshio Obi, Institute of E-government at Waseda University in its release of 2008 “World e-Government Ranking” concluded a comparative study of selected few Countries with E-government infrastructure and found that for accomplishment of e-Government objectives, the involvement of Citizens is of vital importance for which general awareness campaign of usage of e-Services should be launched gradually. The inevitable interaction of governments with its Citizens by the employments of ICT has led to the creation of e-Citizenship which has further transformed into “e-Community” under the umbrella of comprehensive e-government.

Review of the human history revealed that for centuries transactional activities in a society were initiated on the basis of personal acquaintances and faith, however with coming of era of bureaucratic culture, the identification process was changed to paper-based process. With the passage of time, the most commonly reliable identifiers in the society became the “Passport”, “Birth Certificate” or “Driver’s License” (Camp, 2003). For better understanding of PIM following elaborations have been made.

a. “A set of data management systems and practices to increase confidence in the identity of individuals where appropriate” (Crompton, 2004, p. 1)


Sprouting of out of this paper based relationship between government and citizens, the command over the personal administrative affairs of the citizen could not last any more whether completely or partially (Caplan, 2001).

The growing use of digital technologies created an environment for e-government and e-commerce wherein the realization of a system of digital PIM has become more evident than before. But if we look at from the implementation point of view, the dynamic of digital PIM are altogether different from the paper-based identification as it is informational representation rather than physical representation (Lips, Taylor & Organ, 2006).

The growing trends in governments to deploy digital PIM solutions to help materialize the transactional form of e-governance revealed that benefits thus achieved outweigh the cost with the improved ability of the governments to protect human rights, putting into effect the responsibility and lowering of transactional and coordination cost (FIDIS, 2005).
As Lips and Pang conclude that in the choices for adopting PIM in a society, governments must be honest not only to further the confidence of the citizens in expanding role of transactional services offered by e-government models but also to create environment where in the decision may rest with the user for preferred use of e-services in dealing with government (Lips & Pang; 2008).

In simplest way, two definitions of e-government can be quoted as follows:

1. Department of Information Resources, State of Texas defines E-government as “Government Services that take place electronic communications among all level of governments, citizens, and the business community including; acquiring and providing products and services; placing and receiving orders; providing and obtaining information; and completing financial transactions”.

2. Gartner in 2000 defined E-government as “E-government is the continuous optimization of service delivery, constituency participation, and governance by transforming internal and external relationship through technology, the internet and new media”.

The most eloquent definition of e-government is the employment of novel means of information and communication technologies by the government with specific focus on web based applications in the provision of services to its citizens and businesses with the aim of not only giving easy access to government information but also to improve upon its services (Lips et al., 2008).

E-government was not mere retransformation of means of doing businesses by the governments all over the world but also advancements in new information and communication technologies that spurred the growth of e-government(Zhiyuan Fang; 2002).

According to Blake Harris (2000) the ultimate aim of the e-government is to employ the latest information and communication technologies by the different government departments in delivering services to its citizens, businesses and industry in an efficient way that will resultantly decrease corruption, enhance transparency, authorizing citizens, more convenience, financial growth and cost effectiveness. E-government enhances its credibility by bringing governments and businesses closer and closer ever (Zhiyuan, 2002).

In India, Various e-government projects like e-Choupal, e-Seva and AMCUS are playing pivotal role in abridging gap between urban and rural India, Citizens and government and most particularly private Sector Organization and government, with efficient use of latest identifications technologies available in the market (M. L. Singla, 2005)

In most of under developed Countries now there is strong realization on the part of governments to carry out some e-government initiatives which are more customer-focused, cost effective and
Citizen friendly just to bring out change in the internal working of the governments. By this way, they have not only achieved some success in reducing the corruption from the ranks of the government functionaries but to greater extent they have enhanced confidence of the general public in the working of the governments (Pathak, Gurmeet, Rakesh, Rafia and Smith, 2008). Due to easy access to global information, omnipresence of e-commerce and quick responses from the internet, e-citizens are now more obstreperous from public administration for supreme efficiency, more intelligibility and better services. Consoles, accessibility and a harmonized look of applications will now determine the government citizen relationship (Birgit, 2002).

In the modern-day personal identity management (PIM), people resist to share their personal information with respect to public bodies while on the other hand they unintentionally or willingly share the same personal information while using the social media and other commercial/non-commercial online activities. The foremost reason is the fact that people do not consider themselves to be a static data units that will not change over the period of time rather our contention is that PIM must be a system of kind that revolves around the willful use of identity or identities by the human being during one’s lifetime (Zoonen and Turner, 2014).

In the trusted identities environment where in every stake holder may verify identities on some mutual consented terms, the importance of relationship between privacy concerns and trust with institutional assistance and association, have profound effect in generation of trusted identities that will ultimately lead to the equipoise where huge number of benefits of the trusted identities can be materialized (Adjei, 2013).

Instead of brazening out the government’s power, effective citizen participation, supported by electronic government initiatives may unwrap options to collectively construct conducive development circumstances as well as an environment advantageous to the complete satisfaction of human, social, political and economic rights (S. Lannerstrom, 2005). This is not only pertinent to citizens by enhancing their capacity for participation and social power, examining or oversight, but is also significant in the case of leaders or politicians and civil servants by mounting levels of consciousness on the significance of acting and making decisions conducive to the collective well-being (Bhatnagar, 2004). The notion of e-government preceded PIM for its ability to improve democracy and responsiveness to citizens and bring citizens closer to political leaders and enhanced public outreach. Model is shown in Fig 2 and following hypothesis were developed in this regard:-
H1: Personal Identity Management in E-Government is positively related to improvements in government-citizen relationship.

H2: Personal Identity Management in E-Government is positively related to corruption reduction.

H3: Improvements in government-citizen relationships account for more corruption reduction as compared to other variables.


3. **Research Methodology**

It is quantitative and applied research in which correlation between Personal Identity Management System (E-government initiative in Pakistan) and reduction in Corruption and improvement in government citizen relationship has been measured by using a structured questionnaire. The type of study was cross-sectional.

The structured questionnaire has been portioned into seven sections each with a definite purpose like in first section demographic information is being retrieved with nominal scale. The purpose of retrieving personal information of the respondents is to analyze the bent of their mental approach while answering to the question.

The population includes around 14000 employees of the organizations plus only those well-educated and technically well aware citizens who have either undergone one or more services of PIM. Unit of analysis were individuals. Among the major characteristics of population that not a single respondent in this research has been included who has not attained at least secondary level education. Most of the people are service men, business men, housewives and unemployed youth.
The sampling technique employed here was convenient stratified random sampling and strata included subgroups like NADRA, Passport, telecom companies, Semi government and governmental organizations (that are using PIM services) officials and Citizens of Pakistan who are using any of NADRA service like registration for CNIC, National Identity Card for Overseas Pakistanis (NICOP), Pakistan Origin Card (POC), Family Registration Certificate (FRC) or CRC (Child Registration Certificate), Verification System of NADRA (Verisys), KIOSK, verification through SMS alerts, BISP beneficiaries, Flood victims, IDPs, Birth Registration at union Councils (CBRC), Web complaint system, Web tracking facility, Call centers and passport service etc. The study reports the result of 200 x respondents from all over Pakistan and from the countries where in concentration of Pakistanis is high and NADRA registration facility for issuance of ID card is available like Italy, Norway etc.

The justification for using convenient random sampling technique comes from the fact that e-government initiative as that of PIM in Pakistan currently involve many stakeholders most particularly the Organizations that are using PIM verification services and also those Citizen of Pakistan who have directly experienced any of PIM service and hold some technical knowhow of the e-government concept. The plus point of this approach was that it attached extra value to random sampling by ensuring that the population is sampled randomly, resultantly, the enhanced possibility of accuracy.

The data collection method adopted here, was face to face filling of questionnaire and in some cases narration/comprehension of the questions has been made by repeatedly reading the questions before the respondent just to avoid any wrong interpretation of questions being asked. For Senior/top management prior appointments were made and in detailed/lengthy sessions questionnaires have got to be filled. Not a single questionnaire has either been emailed or sent through post.

Data analyses techniques involve the use of t-tests, correlation and regressions on the collected data. However, before running a test, it was required that data be made ready for hypothesis testing. In this regard, some precautionary measures such as data editing and goodness of the data by codifying the data have been taken. Goodness of the data was checked by highlighting the highest and lowest value on the descriptive statistics. Another method used to check the goodness of data employed factor analysis through Cronbach’s alpha and split-half reliability tests.
4. Data analysis

The data were collected from 89% male respondents and 11% female respondents. The most of the respondents related to 20 to 25 years age group and 28% of respondents related to the 36-40 age group. 49% of respondents got university education and 47% of respondents attend college. 61% of the respondents were married and 39% of respondents were unmarried. 57% of respondents were related to services industry, 20% of respondents were students and 12% were unemployed. Results are shown in Fig 3.

![Summary Demographic Profile](image)

**4.1 Magnitude of Public service Corruption in Pakistan**

In the view of respondents experience about corruption, Pakistani respondents view that corruption in Pakistani public service agencies are increasing. Approximately 87% of respondents feel that corruption in Public service agencies are increasing and only 13% of respondents. Results are shown in Table 1.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>26</td>
</tr>
<tr>
<td>Yes</td>
<td>174</td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
</tr>
</tbody>
</table>

Table 1. Magnitude of Public Service Corruption in Pakistan

**4.2 Range of public service corruption in Pakistan**

A large number of respondents rated public service corruption as very high and fairly high. Approximately 85% of respondents rated public service corruption very high or fairly high 5.5% of respondents rated corruption as medium and only 3.5% of respondents rated it fairly low. Results are shown in Table 2.
Impact of Personal Identity Management in e-Government on Corruption and Government-Citizens Relationships

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fairly Low</td>
<td>7</td>
</tr>
<tr>
<td>Very High</td>
<td>169</td>
</tr>
<tr>
<td>Fairly High</td>
<td>13</td>
</tr>
<tr>
<td>Medium</td>
<td>11</td>
</tr>
<tr>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
</tr>
</tbody>
</table>

Table 2. Range of Public Service Corruption in Pakistan

4.3 Experience of time and cost factors in public service delivery and corruption

Table 3 and Table 4 represent the time and cost factor associated with service delivery and how people experience the cost the service user bear in term of spending time in government offices and awaiting results. Only small percentage of user thinks that they are not bearing any cost and time in government offices and numbers of respondents considered cost and time, a major problem.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time is not a problem - Totally Agree</td>
<td>5</td>
</tr>
<tr>
<td>Time is not a problem - Mostly Agree</td>
<td>18</td>
</tr>
<tr>
<td>Time is not a problem - Somewhat Agree</td>
<td>10</td>
</tr>
<tr>
<td>Okay Time Factor makes no difference</td>
<td>6</td>
</tr>
<tr>
<td>Time is a problem - Somewhat Agree</td>
<td>8</td>
</tr>
<tr>
<td>Time is a problem – Mostly Agree</td>
<td>90</td>
</tr>
<tr>
<td>Time is a problem – Totally Agree</td>
<td>63</td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
</tr>
</tbody>
</table>

Table 3. Time factor in Public Service Delivery

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost is not a problem - Totally Agree</td>
<td>3</td>
</tr>
<tr>
<td>Cost is not a problem - Mostly Agree</td>
<td>4</td>
</tr>
<tr>
<td>Cost is not a problem - Somewhat Agree</td>
<td>7</td>
</tr>
<tr>
<td>Okay Cost Factor makes no difference</td>
<td>32</td>
</tr>
<tr>
<td>Cost is a problem - Somewhat Agree</td>
<td>46</td>
</tr>
<tr>
<td>Cost is a problem – Mostly Agree</td>
<td>48</td>
</tr>
<tr>
<td>Cost is a problem – Totally Agree</td>
<td>60</td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
</tr>
</tbody>
</table>

Table 4. Cost factor in Public Service delivery
4.4 Correlation Analysis

Table 5 indicates the relationship of different variables. According to the result, there is a significant positive relationship between e-Government initiative and Government citizen relationship (0.457) at the level of 0.01. There is a significant positive relationship between e-Government Initiative and Corruption reduction (0.202) at the level of 0.01. Furthermore, there is positive relationship between Government Citizen Relationship and Corruption reduction having value (0.407) at level of significance.

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Government Citizen Relationship</th>
<th>Corruption Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>e-Government Initiative</td>
<td>0.457**</td>
<td>0.202**</td>
</tr>
<tr>
<td>Government Citizen Relationship</td>
<td>0.407**</td>
<td>0.165</td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level (1-tailed).

Table 5. Correlation Analyses

4.5 Regression Analysis

Table 6 represents the regression result. The regression result indicate the positive impact of e-Government initiative on Government citizen relationship having value ($\beta = 0.457$, $\rho < 0.01$) and 20.9% variance explained by independent variable. Result demonstrates the positive impact of e-Government Initiative on Corruption Reduction having value ($\beta = 0.202$, $\rho < 0.01$) and 4.1% variance explained by independent variable. There is a positive impact of Government Citizen Relationship on Corruption Reduction found having value ($\beta = 0.407$, $\rho < 0.01$) and the total variance explained by 16.5%.

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Government Citizen Relationship</th>
<th>Corruption Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>e-Government Initiative</td>
<td>0.457**</td>
<td>0.202**</td>
</tr>
<tr>
<td>Government Citizen Relationship</td>
<td>0.407**</td>
<td>0.165</td>
</tr>
</tbody>
</table>

Table 6. Regression Analysis
Impact of Personal Identity Management in e-Government on Corruption and Government-Citizens Relationships

4.6 Hierarchal regression

To check the Mediating effect of Government-Citizen Relationship in the relationship of e-Government Initiatives and Corruption Reduction, we conduct hierarchal regression. In First step, we regressed Corruption Reduction by e-Government Initiatives and in Second step, we Regress Corruption Reduction by e-Government Initiatives by putting Government Citizen Relationship in between the relationship. The result of Mediation analysis demonstrates the Mediating effect of Government Citizen Relationship in the relationship of e-Government initiatives and Corruption Reduction. The value of Main effects size reduces ($\beta = 0.202$, $p < 0.01$ to $\beta = 0.020$, $p > 0.05$) and explained variance reduces ($\Delta R^2 = 0.00032$) and become insignificant. The Mediation result shows that Government Citizen Relationship is the variable that translates e-Government initiative to Corruption Reduction. Results are shown in Table 7.

<table>
<thead>
<tr>
<th>Predictors</th>
<th>$\beta$</th>
<th>$R^2$</th>
<th>$\Delta R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEP 1 (Main effects)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e-Government Initiatives</td>
<td>0.202**</td>
<td>0.041</td>
<td></td>
</tr>
<tr>
<td>STEP 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government-Citizen Relation</td>
<td>0.0397**</td>
<td>0.165</td>
<td></td>
</tr>
<tr>
<td>e-Government Initiatives</td>
<td>0.020</td>
<td>0.166</td>
<td>0.00032</td>
</tr>
</tbody>
</table>

** Significant at the level of 0.01
Dependent Variable: Corruption Reduction

Table 7. Mediation Analyses

Generally speaking, most of the respondents consider that government agencies/Departments in Pakistan are not well equipped and triggered off to construct sound government-citizen partnerships. Pakistani Citizens visualize very less of the internal workings of government on this front. Bureaucracy is more or less redundant and very less consideration is being given to improving transparency with effective utilization of e-Government processes. Time, cost and red-tape procedures are major hurdles in public service delivery. Government of Pakistan should be hard pushed to build up citizen-centric models that involve enhanced partaking of key stakeholders outside government i.e. in private sector to achieve efficiencies and advance the resources available to citizens.

Government of Pakistan is required to undertake watchful steps to guarantee better reach and access, otherwise discrepancies in access to resources will only exacerbate the existing level of corruption and social and economic injustice. Thus investments in ICT/ e-government initiatives
Impact of Personal Identity Management in e-Government on Corruption and Government-Citizens Relationships

like that of PIM need to be linked with more extensive development agendas in Pakistan in order to bring effective improvements in government citizen relationship and ultimately reduction in corruption from the public sector.

The data analysis revealed the fact that considerable improvements in government-citizen relationship has led to reduction of corruption in various departments that are utilizing PIM in e-government in provision of various services to general public. The data reliability has not only enhanced general public confidence in public service departments but on the other hand these departments have also achieved enhanced level of work efficiency, transparency, accountability, flow of information, abolition of red tapism, responsiveness & service flexibility and access to information for general public.

5. Findings and recommendations

In addition to some narrated requirements given in the questionnaire for successful implementation of e-government initiatives in Pakistan, respondents were given open choice to express their views in the last section on the subject i.e. PIM in E-government and fight against public sector corruption. Resultantly, the response that we received is worth mentioning here in our last part of thesis and will certainly be helpful for future research endeavors.

The gist of all the suggestions, proposals and admonitions is that whenever initiatives like that of Personal Identity Management system is undertaken at governmental level it should not be void of such provisions which completely ignores the overall status of literacy in the country, and also penetration of internet and its related IT infrastructure in the country. Some funds out of such initiative should be earmarked for the uplifting of the standard of education and basic infrastructure without which such projects may face a big failure.

In fight against corruption, though ICT and use of latest technology with effective support of database like that of PIM may play pivotal role but road to the success lies in the extent of access to public information, laxity in bureaucratic rules and last but not the least the political will of the government. Furthermore, to fore thwart any misuse of such information, tempering with databases by the officials, hacking of information by the criminals some Cyber laws must be introduced to make such projects a success in fight against corruption.
Impact of Personal Identity Management in e-Government on Corruption and Government-Citizens Relationships

Among the potential barriers that lie in the successful implementation of such projects that will ultimately realize into transparency in government practices and working, is the bureaucratic delaying tactics. As materialization of e-government concept in Pakistan means reining in the high handedness, accountability of actions, and most particularly the curtailing the power of bureaucracy.

The success of Personal Identity Management System in manifestation of e-government in Pakistan lies in the integration process i.e. different governmental entities in the lines of Immigration and Passport (IMPASS) be aligned with NADRA database. The departments like that of Police, FIA, Land revenue system, excise and taxation, FBR, Judiciary most particularly lower courts and Customs where incidence of corruption is high be integrated with National Database so that system of governance may evolve where in accountability through system should be facilitated.

6. Managerial Implications

From the management point of view, the study has also made some important contributions in the field of Personal Identity Management as e-government tool by highlighting various areas of concerns that may lead to ultimate success of the system. Some of which are as under:

- PIM should not be taken as database model solitarily rather the system should be introduced and integrated as complete solution in implementation of e-government.
- In this study it has also been underlined that Software Interfaces/Solutions most particularly web based applications can play pivotal role in enhancing government-citizen relationship.
- The study also highlights the importance of managerial control from the strategic point of view in running the governmental affairs in case PIM in e-government is successfully implemented.
- The study also gives an insight into the importance of data for planning and development purposes and that has many economic prospects in future growth and development of the Country.

7. Conclusion
While e-Government initiatives like that of PIM promise great prospects in many developing countries like that of Pakistan, however still some significant challenges need to be faced. As, it has been observed that many e-government initiatives like that of establishment of e-government directorate fail because of unsatisfactory preparation and political shakiness. These challenges require successful execution of corresponding right technologies with comprehensive and progressive reforms programs and government schemes. The surveys in Pakistan narrated description in this research confirm that corruption is considered to be major dreadful effects on the functioning of government departments in Pakistan and the public sector red tapism is the prevalent stumbling block in the way of improved government-citizen relationships. It can easily be recommended that e-Government initiatives like that of PIM can facilitate in eradication of corruption and also in nurturing of government-citizen relationships in developing countries like that of Pakistan. As it is evident that e-Government initiatives cannot eliminate all the structural supporters that generate corruption in society and most particularly in Government institutions, but, with the well-conceived and planned implementation strategies, such initiatives can strengthen these critical variables in combating corruption and bringing improvements in government-citizen relationships.

References
Impact of Personal Identity Management in e-Government on Corruption and Government-Citizens Relationships


Impact of Personal Identity Management in e-Government on Corruption and Government-Citizens Relationships


Web Sources

Birgit Wilder, Chief Information Office Austria A-1010 Vienna, Parkring 10/1/505 Birgit.Wilder@cio.gv.at, “e-government – e-citizen”.


Centre for Civil Society, India http://www.ccsindia.org/npm.asp


World Bank’s definition of e-Government http://go.worldbank.org/M1JHE0Z280

Bibliography

Aldona Val Icent “Blue Print for Change” a special report sponsored by Oracle, 2006.


Miriam Lips with assistance of Chiky Pang,Victoria University of Wellington, (2008), “ Identity Management in Information Age Government exploring concepts, definitions, approaches and Solutions”.
Poverty Reduction Section of UNESCAP’s report titled “What is good governance”.
How students use social media for information searching?

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Abstract

This article deals with a research in progress conducted with private universities, located in São Paulo - SP - Brazil, in which were analyzed some aspects of the use of social media selected: WhatsApp, Facebook, LinkedIn, YouTube, Instagram and Twitter. The application used was SurveyMonkey for the preparation of a questionnaire to be answered by students of the universities. The primary research question is "How social media are most used by students". This research is in progress, but at the conclusion of the article are presented some preliminary results that can contribute to clarify the primary research question.

Keywords: social media, universites students, common utilization

Introduction

Currently social media are present in the day-to-day reality of people in the greater part of their daily activities. There are several definitions for social media, being that second Kapoor et al. (2018) all consider social media as tools of communication supported by Internet-based technologies for dissemination of information and the majority of them recognizes the high concentration of user generated content on these platforms. Even as Kapoor et al. (2018), it was proposed the following definition: "social media is composed of multiple platforms geared to users that facilitate the diffusion of attractive content, creation of dialogs and communication to a wider audience. It is essentially a digital space created by the people and for the people, and provides a conducive environment for which the interactions and the network occur at different levels (for example, personal, professional, commercial, marketing, political and social)."

It should be noted that the increasing importance of social media as a means of communication in the routine of individuals, especially the new generations, has led to a considerable impact on the functioning of enterprises, in organizational decisions, individual and society itself.

The basic problem is to find out if these new communication tools are being properly used, in accordance with the objectives for which they were created. In this way, it is worth discovering as they have been applied and for what purposes.

Thus, it is interesting to analyze how this happens in the academic environment, where new generations of professionals are being trained and make use of social media on a routine basis.

The objective of this study is to evaluate how social media are used by a group of students from various private universities. It is intended to verify which are the most commonly used media and for which purposes are employed, for academic works and also for personal use.

As Rabello and Gomes (2011), "the contemporary social relations also suffer the impact of digital networks of communication, making explode the phenomenon of social networks on the Internet, characterized by the relations between people of different social groups through a
Research Methodology

In a literature review on the topic, searching the Web of Science with the topic "social media" AND universit*" and considering the years of 2014 to 2018, was obtained ninety eight results that were analyzed aiming to select those who were more aligned with the research. Thus, was acquired nineteen articles that meet the objectives of the study. It should be noted that a majority of the texts dealt with the use of social media by the student body. Highlight for the employment of Facebook, Twitter and WhatsApp as tools most frequently used.

The study of Rasiah (2014) found evidence that the use of Facebook created a learning environment more positive and less threatening, which breaks the engagement of students and the learning experience, while at the same time created a stronger relationship between them and with the speaker. It was also found that Facebook has provided a rich learning environment based on team that was used to channel the creativity of students in a virtual environment.

The study of Adalberon and Saljo (2017), serves as an example of how students use Facebook groups as part of their studies. The results show that they are using Facebook as a space to share information predominantly practices. Although it may be a popular medium for many users in other activities, there seems to be a minority of users who actively participate in these groups generated by students. The proportion of discussions that relate to academic issues is low, and these discussions are not sustained for long periods of time. However, it is still an interesting observation that the students themselves create and use Facebook groups as resources to manage the university life. Thus, there is a perception of the necessity of such spaces based on courses in academic life, even if they may not become very active as the course continues, and even if they are not part of the academic institution or the discussion and learning of academic knowledge.

It is intended to study the use of social media by students of four private universities in São Paulo. To do so, it was used the survey methodology with questionnaires that were accessed by students via Internet.

Based on studies conducted by other authors, such as Hussain (2012) and Al-Rahmi and Othman (2013), the research questions are the following:

• The main issue of research: how social media are most used by students?
• Secondary issues of research are:
  • How often do you use social media?
  • For what purposes are social media used?
  • How are social media used? What are the most common activities?

About the survey data on social media, McKenna et al. (2017) pointed out that few qualitative studies uses data collected in social media. According to these authors, "Most of the quantitative researchers used data directly extracted from social media platforms." The types of quantitative
data varied, but included data such as message counts, messages are downloaded, count of friends, number of posts or level of participation. Only a few articles used quantitative data from online surveys. On the other hand, the majority of qualitative articles on social media did not use qualitative data extracted directly from social media platforms.

**Literature Review**

According to Juliani et al. (2012), "students are already familiar with social networks. Even if you don't want to mix education with pleasure, they already know how to use these tools, so it is easier to exploit its resources." On the other hand, there is a concern with the loss of focus on learning, caused by the constant use of social media and in most educational institutions access to these sites is blocked. As Juliani et al. (2012), "it is expected to generate a self-promotion of the educational institution as the activities are published and the content is shared. In this sense, another higher result achieved by the use of social networks outside the virtual learning environments, lies in the fact that it is possible to involve other actors such as businesses, parents and the community itself where the institution is inserted".

According to Razmerita and Kirchner (2014), "the new generation of students defy the educators with low tolerance to long lectures, have a tendency for multitasking, are very pragmatic and less patient in the classroom. Therefore, designing new methods of teaching and learning is a continuous effort for educators. However, we still need an answer to the question about what can be obtained using the new Information and Communication Technologies (ICT) within the classroom and to deal with the problem of students' attention."

As Gikas and Grant (2013), in a survey on the use of mobile phones, smartphones and social media in higher education, there are positive and negative aspects in the employment of these artifacts. About the perceived advantages can be grouped in the following aspects: quick access to information, communication and collaboration in content, variety of forms of learning and contextualised learning. About the disadvantages, there are: teachers who are averse to these Technologies and this challenges the adoption of these technologies and the distraction caused by the use of the same.

According to Dwivedi et al. (2018), "the social media tools have helped to break down the geographical barriers that previously restricted communication and led to an explosion of electronic participation, virtual presence and online communities. The benefits of social media professionals include sharing information, advertising, and give and receive support and advice." Also according to these authors, "a radical transformation of communication which was enabled by social media presents a fascinating environment to scholars from all backgrounds. People navigate and contribute with their social media accounts regularly using smart devices; some people even prefer to communicate using social media instead of attending face-to-face interaction. However, the communication using social media can be more challenging, because emotions can be difficult to detect and understand.".
Run the search

In order to do the research, it was used the application SurveyMonkey because it is an appropriate tool for this task. The questions that were drawn were based on primary and secondary issues of research and dealt with the following social media: WhatsApp, Facebook, Instagram, Twitter, LinkedIn and YouTube. The selection of these media was based on experience with the students and were also chosen because they have practical applications that can be used for academic, work or personal purposes.

Each question had a goal to achieve. There are questions that measures the degree of relative importance of the social media studied. Other questions seek to evaluate the time of use for each media. Finally, it was evaluated which use was more frequent among some options.

The main questions used and answered the questionnaire were the following:

- On selected social media that you normally use, which ones do you use the most?
- For each of the selected social media, which is the most frequent use?
- For each social media selected, what is the most common weekly usage?

For this questionnaire were obtained ninety-seven responses for the four universities surveyed. There was some resistance to respond to the questions and continued encouragement was required to reach this quantitative response. After the deadline for the survey, the information obtained was analyzed.

Analysis of results

When verifying the answers to the questions presented, it was possible at the moment to obtain the following findings:

- Social media most frequently used was the WhatsApp, with a large advantage over Instagram and Facebook, which remained in second and third places respectively. What was perceived is that the WhatsApp has played a significant role in the communication between people in different social relationships with family, friends and colleagues at work and in the university environment.
- With regard to the most frequent use it is that:
  - WhatsApp is used for contact with friends, sending any type of message
  - Facebook is employed for fun and keep informed about the activity of friends
  - Instagram has the advantage of having access only with the photos and information from friends and of specific interest
  - LinkedIn is used to maintain the professional networking and the possibility of creating opportunities to provide service
  - Twitter is a social media very little used, according to this survey
  - YouTube is employed to obtain new knowledge in specific trainings and for entertainment with new videos
- Concerning the average weekly usage of social media verified that they are all used up to eight hours per week, with the exception of Twitter which is very seldom used.
With respect to what was observed in the survey, it appears that students use Instagram and WhatsApp for communication, whether for personal, work or academic. With regard to this last aspect, for academic purposes, the priority is to use WhatsApp. YouTube is used for entertainment purposes and for training in specific subjects. LinkedIn is employed solely for professional purposes, while Twitter is very little used.

The limitation for ongoing research lies in the fact that it was done in only four private universities, because if this research were enlarged it could have different results. On the other hand, if demographic data were available, it would be possible to obtain more stratified analyzes in terms of age, gender, income and other information of this type.

Bibliographical References


BARBOSA, C. C. - Ownership of Social Media as a resource in teaching-learning process; 3º Simpósio Hypertext and technologies in education,

COMBS, C.. - coherence and transparency: some advice for qualitative researchers, Production, 27, and20170068, 2017


FORMENTIN, C. N. and LEMOS, M. - Social Media and Education; Proceedings of the III Symposium on Teacher Training - SIMFOP, 2011

GIKAS, J. AND GRAT, M. - Mobile computing devices in higher education: Student perspectives on learning with cellphones, smartphones & social media; Internet and Higher Education, 2013

HUSSAIN, I study avaliar social media trends among university students, proceeded Social and Behavior Sciences, 2012


KAPOOR, K. K.; TAMILMANI, K.; RANA, N. P.; PATIL, P.; DWIVEDI, Y. K. and NERUR, S. - Advances in Social Media Research: Past, Present and Future; Information Systems...

MCKENNA, B., Myers, M. D. AND NEWMAN, M. - Social media in qualitative research: Challenges and recommendations, Information and Organization, Volume: 27 Issue: 2 Pages: 87-99 Posted: Jun 2017

NKWE, N. and COHEN, J. - Impact of social network sites on psychological and behavioral outcomes in the work-place: a systematic literature review, 25th European Conference on Information Systems (ECIS), Guimarães, Portugal, June 5-10, 2017


ROCHA JUNIOR, V. et al - The Use of Social Media in Higher Education; Brazilian Journal of Management and Innovation, 2014


SOUZA, M. V. AND SIMON, R. M. - Social Networks And MOOCs: Analysis of Media for an education in network; Esud 2014 - XI Brazilian Congress of Higher Education at a distance, 2014
MOBILE PHONE FOR FINANCIAL INCLUSIVENESS AND EMPOWERMENT: A CASE STUDY OF ANCHOR BORROWERS PROGRAMME

Abdulhamid Aliyu Ardo
Efpraxia D. Zamani

Topic Area: - Ubiquitous and Mobile Information Systems
MOBILE PHONE FOR FINANCIAL INCLUSIVENESS AND EMPOWERMENT: A CASE STUDY OF ANCHOR BORROWERS PROGRAMME

Abstract

It is an unarguable fact that there exists a gender gap in access to financial services in developing countries. Lack of financial access leads to the inability of women to properly participate in both economic as well as social activities in their immediate societies. In this paper, we propose an investigation into how mobile phones can contribute towards financial inclusiveness and empowerment of female farmers in an insurgency-ravaged community in Nigeria. To this end, we propose an interpretive case study in order to understand the social context of mobile phone use by rural women who are engaged in farming activities, using Sen’s Capability Approach as our theoretical lens.

Keywords: Empowerment, Financial inclusion, Interpretive research, Capability approach

1.0 Introduction

This research is focused on understanding how mobile phones contribute to the financial inclusiveness and empowerment of women farmers in a developing country like Nigeria. Financial inclusion in developing countries is a phenomenon that has been investigated by many researchers (e.g., Rhyne & Otero, 2006; Mayoux, 2010). An estimated 700 million unbanked people became account holders between 2011 and 2014 (Birochi & Pozzebon, 2016). Despite the increase in the number of banked people, rural dwellers, especially women, are still excluded from formal financial services (Kunt, Klapper, & Oudheusden, 2015).

In this research, financial inclusion is defined as the proportion of people having access to and using formal financial services (World Bank, 2014). This means that the people having access but not using financial services are equally financially excluded. Financial inclusion is proxied by account ownership, access to credit, and insurance penetration (Abor et al., 2018). Thus, when people lack access to financial services, their ability to participate in economic as well as social activities are also reduced. This brings about financial hardship which ultimately increases the rate of poverty in the community. Lack of access to financial services especially in developing countries can be attributed to many factors, including high cost of service, poor infrastructure and religious or cultural factors (Lapukeni, 2015).
Financial inclusion has been recognized as a vehicle for spurring economic activity especially in the developing regions of the world. It has the potential of reducing poverty, and increasing the productivity of small industries (Lapukeni, 2015). Despite the numerous benefits of financial inclusion, an estimated 2 billion adult population still remain without active bank accounts (Demirguc-Kunt et al., 2015). However, the ever increasing number of individuals who own mobile phones is expected to turn things around (Walsham, 2017).

In this research, we are particularly interested in studying the contribution of mobile phones in insurgency-ravaged communities of developing countries like Nigeria. In what follows, we discuss the motivation for this research, we introduce the research problem and unpack the proposed research design.

2.0 Motivation and Background

Mobile phones have impacted the world population more than any other technology (Rotberg & Aker, 2013; GSMA, 2013). About 3.2 billion people worldwide own a mobile phone (GSMA, 2013), and in Africa, East Asia and Latin America, it is estimated that 28.5%, 46% and 66% of the people own a mobile phone as of 2007, respectively (Andrianaivo & Kpodar, 2012). Even though developing countries are challenged by a huge lack in infrastructure, mobile phones are seen as a means to its impact. The increased ownership and usage of mobile phones may be due to its relative affordability, even by those living in the rural areas (Ouma et al., 2017). The mobile phone offers its users access to a wide range of services that were out of their reach in the recent past. The most important is access to financial services.

In order to increase productivity and decrease the numbers of financially excluded people, governments around the world are continuously introducing new ICT intervention programmes, targeted at these vulnerable populations. There has been a huge investment in ICT interventions in developing countries in the past few years aimed at empowering the poor (Dasuki & Abbott, 2015). In Nigeria in particular, these ICT interventions include licensing of mobile money operators (Adaba & Ayoung, 2017), introduction of the Growth Enhancement Scheme (GES) as well as the Central Bank of Nigeria (CBN) Anchor Borrower’s Programme (ABP) (CBN, 2016), all of which are aimed at promoting financial inclusion through mobile phone technology.

ABP was launched in November 2015 with the aim of reducing poverty among rural farmers through increased access to financial services. The programme kick-started in all
states of the federation with farmers forming cooperative groups of between 5 and 20 farmers (CBN, 2015). After harvest, Anchor companies are expected to buy the produce and give the farmers the cash equivalent. Similar agricultural schemes aimed at poverty reduction and empowerment in the past included the growth enhancement support scheme (GES). The GES scheme was aimed at rural farmers, facilitating the purchasing of farming implements, such as fertilizer, over a mobile phone directly from producers; thereby reducing corruption and middle men in the value chain (Nwalieji et. al., 2015).

As agriculture continues to be the most dominant source of income for rural dwellers in developing countries like Nigeria, we consider farming as an important activity for studying the contribution of mobile phones towards financial inclusion initiatives (Ouma et. al., 2017).

3.0 Research Problem

The number of people lacking access to financial services is on the increase in developing countries. It is therefore imperative to address the problem that financially excluded people face today, with the aim to identify ways to reduce the barriers for participating in economic and social activities. We specifically focus on female rural dwellers as they are those most impacted and denied access to formal financial services.

The extant Information Systems literature has shifted from discussing whether to how ICTs are empowering the poor (Walsham et. al., 2007). Previous studies have looked at the contribution of ICTs such as the radio, television and fixed telephony (Andrianaivo & Kpodar, 2012). However, the contribution of mobile phones begun being discussed fairly recently. The explosion of mobile phone technology in African markets has effectively integrated a large proportion of the unbanked population into formal financial services (Ouma et. al., 2017). Since the successes recorded by M-PESA in Kenya, mobile phones have been used as a tool for reducing the financial infrastructure gap, and have been shown to be a source of revenue and competitive advantage (Adaba & Ayoung, 2017). M-PESA has also led to a reduction in the cost of competing mobile money operators and increased banking penetration (Mbiti & Weil, 2011). Further, Jensen (2007) identified a positive impact of mobile phones in reducing price volatility in the fish markets. Similarly, there is evidence that mobile phones benefit farmers by helping them increase their income from the sale of farm produce (Wijeratne & Silva, 2014).

A number of studies have looked at the contribution of financial inclusion intervention projects on the economic growth of developing countries from the gender perspective (Abor
et al. (2018), however findings are inconsistent. For example, Swamy (2014) found that financial inclusion intervention projects in developing countries have led to an increase in income by 8.40% and 3.97% among women and men respectively. However, another study by Nanziri (2016) did not report any income variance between men and women in South African as a result of the introduction of a financial inclusion intervention project.

Within the IS literature specifically, the link between ICTs and gender has been documented since the mid-1990’s (Walsham et al., 2017). However, early studies in the ICT4D domain have given very little or no attention to gender related issues. For example, Walsham and Sahay (2006) did not make any reference to gender differences. Over the recent years, there has been an increased attention towards these gender issues (e.g., Masika and Bailur, 2015), which is evidence of the criticality of gender issues for the ICT4D domain, where since women are important actors in most sectors where ICTs are introduced, including the agricultural, health and educational sectors. However, there is still a lack of clarity and consistency in the existing literature (Walsham, 2017).

To address this, the proposed study will analyse the mobile phones’ role in promoting the financial inclusiveness of women within rural areas, where the majority of the populace is poor (Walsham, 2017). Our objective is to explore to what extent mobile phones promote development in a frail economy. We further focus on the development and empowerment of women farmers through mobile financial inclusion in a rural community ravaged by Boko Haram insurgency, particularly because insurgency impacts women disproportionately and fuels disparities.

Against this background, we follow the calls by different researchers (e.g., Orlikowski & Iacono, 2001; Chiasson & Davidson, 2005) for IS theory development within the ICT4D domain (Avgerou, 2010) and develop the following research questions:

How do mobile phones enhance women farmers’ financial inclusiveness and empowerment in the rural areas affected by Boko Haram insurgency?

What are the factors that influence women farmers to use mobile phones for their own development in the rural areas affected by Boko Haram insurgency?

4.0 Research Approach

In order to address our two research questions, we adopt the interpretive research approach (Walsham, 2006). Interpretivism aims to explore and understand the social context of use of an IS, where reality is socially constructed due to the subjectivity of people’s
perceptions. For the context of this study, interpretivism seems to be the most suitable perspective because the social aspects of human life such as culture, politics and religion, which are integral for our understanding, can only be examined through assigning meaning to human actions.

The study will be carried out in Adamawa State, which lies in the North-Eastern part of Nigeria and is impacted by the Boko Haram insurgency. The North-Eastern part of Nigeria is an interesting region for studying women empowerment and financial inclusion through mobile phones for a number of reasons. First, the region is characterised by high levels of illiteracy and poverty (Usman, 2015). Second, the activities are only beginning to pick up with the recent reconstruction and rehabilitation of towns destroyed by the insurgents including mobile infrastructures and banking services.

5.0 Theoretical Lens

The choice of a theoretical framework in any research (ICT4D domain inclusive) depends on the aim of the study. It is key to any research endeavour as it aids the researcher to remain reflexive on what is been investigated (Gregor, 2006). In IS research, frameworks have been borrowed from psychology, anthropology, economics and computer science to mention a few.

For this study, we will be using Sen’s Capability Approach (Sen 1984, 1992, 1993) as the preferred framework for this research. The Capability Approach is concerned with expanding human freedom in general and not narrowing it to just technological advancement or increase in personal income (Sen, 1999). In this respect, human freedom includes increased access to the web and the ability to increase ICT literacy levels (Sen, 2005). This approach is particularly valuable for our research because we seek to examine the contribution of an ICT4D intervention towards improving human well-being and supporting development through financial inclusion. The question that needs to be asked is if ICT4D initiatives are capable of empowering the rural population and what are they empowering the population to do (Dasuki et. al., 2014).

The Capability Approach has been widely influential for the ICT4D research (Tshivhase et. al., 2016). Many researchers have discussed its significance for looking beyond economic benefits and assessing the impact of ICT in promoting development in developing countries (Thapa & Saebo, 2014; Robeyns, 2006; Zheng & Walsham, 2008). For
example, Smith et al. (2011), based on the Capability Approach, look into mobile phones and their contributions towards financial access through the expansion of their market boundaries, as a result of expanding citizens’ functionings, such as increased access to government services. Similarly, Grunfeld (2014) studied how ICTs contribute to sustainable development through the lens of the Capability Approach, by expanding the capabilities of Cambodian farmers. Aricat (2015) adopted the same approach to investigate the use of mobile phones by migrants in Singapore, while Wahid & Furuhol (2012) investigated mobile phones in the Indonesian agricultural sector of Indonesia.

6.0 Method

The research design for the proposed study is that of a single case study (Yin, 2003), seeking to understand how mobile phones empower the women who are engaged in farming activities within Adamawa State, Nigeria. The case study method is an empirical inquiry into a contemporary phenomenon within its real-life context, where the boundaries between phenomenon and context become blurred and multiple sources of evidence are used (Yin, 1984). It is widely used for studying community-based problems (Johnson, 2006) and phenomena such as poverty, unemployment, and illiteracy, and allows their investigation from the participant’s perspective.

The impact of Anchor Borrowers Programme as an ICT initiative has not been formally evaluated since its introduction in 2015 in an insurgency ravaged community. A recent study by Evbuomwan and Okoye (2018) tried to evaluate the prospects of the ABP scheme for small farmers in Nigeria and showed the impact of ABP on farmers with regards to improvement of yield per hectare of rice cultivation in Kebbi state. Another study by Zakaree et al. (2018) examined the impact of ABP on prices of agricultural commodity and employment generation in the same Kebbi state. However, there is no other study in the authors’ knowledge that have looked at the impacts of the programme with specific interest on women farmers within an insurgency ravaged community. Thus, an in-depth investigation through a single case study will allow us to understand its impact on women farmers in Adamawa State who participate in this programme (unit of analysis) and how mobile phones have contributed towards their financial inclusiveness and empowerment against the backdrop of insurgency.
7.0 Data Collection Methods

Data will be collected through the usual approaches employed by IS interpretive studies, namely semi-structured interviews and field observations. In addition, we will use secondary material as well, such as previously published material regarding the topic and context under investigation, in conjunction with press and media reports. A significant practical problem with data collection is gaining access to women in a region of Nigeria where religion and cultural factors play a significant role in their lives. It is possible that some women may be somewhat unwilling to engage in conversation with men, other than their husbands and relatives. To address this challenge, these interviews will be conducted by the first author, who will identify himself first as a Muslim and as a native of the region. It is hoped that this will make many of the women to feel more relaxed and open to discussion. We will also engage as surrogates the few educated women among the farmers for the collection of data and information from their colleagues in order to approach those who may still be unwilling to participate. The collated material will be transcribed and analysed through thematic analysis (Braun and Clarke, 2006).

8.0 Expected Study Contributions

This study aims to make a theoretical as well as practical contribution to the ICT4D research domain in developing countries as explained below. With respect to our contribution to the existing literature, through the application of the Capability Approach, we will provide a rich description of the factors supporting female rural farmers in becoming empowered and financially included, focusing on an area impacted by insurgency. While there are IS studies that explore women empowerment through mobile phones, to date and to the authors’ knowledge, research has not yet focused on the negative impact of insurgency and how it may counteract empowerment and financial inclusion.

The study’s practical implications will be along the lines of providing empirical evidence to government and policy makers with respect to the impact of mobile phones and government-led ICT initiatives on women farmers in insurgent-affected regions to ensure financial inclusiveness. In light of the 2013 GSM mobile phone shutdown as a counterinsurgency measure, we consider that our findings will be of increased value, as they will highlight the unintended consequences (Jacob and Akpan, 2015).
MOBILE PHONE FOR FINANCIAL INCLUSIVENESS AND EMPOWERMENT: A CASE STUDY OF ANCHOR BORROWERS PROGRAMME

References


MOBILE PHONE FOR FINANCIAL INCLUSIVENESS AND EMPOWERMENT: A CASE STUDY OF ANCHOR BORROWERS PROGRAMME


MOBILE PHONE FOR FINANCIAL INCLUSIVENESS AND EMPOWERMENT: A CASE STUDY OF ANCHOR BORROWERS PROGRAMME


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Abstract

This developmental paper provides an overview of the factors influencing knowledge management (KM) practices in academic libraries as currently understood and presented in the literature. Important here is the discussion pertaining to organizational culture, KM strategy development and the role of information communication technology in KM within academic libraries as critical factors. The paper also presents an overview of KM by clarifying the necessary terminology from relevant studies in the literature that have focused on KM. Factors which are regarded in the literature as contributing to the failure of successful implementation of KM practices are also discussed.

Keywords: organizational culture, KM strategy, ICT Infrastructure

1.1 Introduction

The present study will be conducted at a time when KM is gradually acquiring significance for academic libraries. The study explores significant and critical factors as enablers and influencers of KM in academic libraries. In identifying the factors that influence KM the study also attempts to identify challenges and related benefits of the practices of KM in academic libraries. It is also important for the purposes of this study to understand how library professionals, staff and management perceive the practice of KM.

It has been reported that the KM initiative effectiveness is based on various factors which are critical to the success factors as including the organizational structure, culture along with the HRM practices. It also includes the information and communication technology which are also referred to as the Knowledge Management enablers and the strategy of knowledge management. There is underlying gap in the knowledge management within libraries when it comes to the right management strategies required to manage the content and knowledge based on the academic records (Mohammad Nazim, 2018).
For the organizations to reap the knowledge management outcomes fruits and enhance their overall performance along with acquiring the organizational creation, it is really important and significant that they need to make sure that their organizational strategies are well aligned with their knowledge management strategies. This shows that an organizational strategy along with the business model helps in setting out the tone for the appropriate management of knowledge which helps in identifying the right initiatives to be taken that could support the mission and help in strengthening the competitive position and help in creating the value (Madge, 2010).

The previous studies have reported (Sarrafzadeh et al., 2010; Sinotte, 2004) that the lack of consensus has led to many of the LIS professionals not being highly and involved within the KM programs which makes the libraries deprived from having the influential role in this field and also hinders the libraries from reaping on the required KM services benefits to have the required improvements and innovations. The libraries thus need to take on the effective steps that could help in the implementation of various business practices that could aim in enhancing their effectiveness while also improving their services. The major gap also comes into place when the libraries have to face with the personnel and budget cuts along with the constant changes that are required in user needs and meeting the changing expectations.

Even though other studies have researched this area - KM in academic libraries (Sarrafzadeh et al., 2010; Kim & Abbas, 2010; Tripathi and Kumar, 2010) - there is still a limited amount of literature which library professionals can readily use for a better implementation of KM.

In light of this investigative focus, this study seeks to answer the following research question:

*What are the factors that affect KM practices in academic libraries in relation to KM strategy, organizational culture and information and communication technology infrastructure?*
1.2 How is KM Conceptualized in the Literature?

KM is applicable to the utilization of an organization’s knowledge and ensures that there is an effective practice of knowledge, enhanced organizational performance and behavior through the creation, coding, storage, acquisition, application, and sharing of knowledge (Ghani, 2009). Knowledge as a significant and intangible asset that aids in the success of an organization in terms of performance and productivity (Raula, Vuksic & Stemberger, 2012) needs adequate and effective storage, identification, dissemination, and retrieval within organizations so as to achieve a competitive edge in a sustainable manner (King, 2009). KM has a multidimensional form that is specific and essential to individual performances in an organizational system (Koudouovoh, 2014). In this regard, organizations have to devise strategies to change tacit knowledge into explicit knowledge so as to derive maximum benefit from the intellectual capital of the organization (Omotayo, 2015).

The practice of KM is also viewed as a potentially viable solution to the existing challenges being experienced by professionals within information organizations (Sarrafzadeh, Martin & Hazeri, 2010). The practices of KM are significant for organizations and companies as they assist the management in promoting knowledge dissemination, knowledge acquisition, and the retention of intellectual capital (Sunassee & Sewry, 2011). In addition, the practices of KM have been linked with an organization’s success; Mikulecky & Lodhi (2009), state that organizations are most successful when they incorporate the practices of KM as part of every organizational member’s responsibility.

The literary has shown (Mohammad Nazim, 2018) that within the library context, the approach of KM helps in transforming the traditional roles of the librarians towards moving towards activities that aim to capture and then manage the internal tacit of knowledge and help in facilitating the knowledge sharing which is not just among the employees but also between the library users and the employees. The KM has been one of the aforementioned
perspectives, but it has mostly been used in the business sector and thus it has become difficult to implement in the non-profit organizations and libraries while these libraries need to take steps in order to enhance the business practices implementations which could aim to enhance the effectiveness of their performances and improving their services.

1.3 KM in Academic Institutions and Libraries

Academic libraries are viewed as knowledge-generating organizations and also as a system of integrated practical activities and business processes that collaboratively operate for the purposes of facilitating and accomplishing the general goals and objectives of an organization (Daneshgar & Parirokh, 2007). According to Kim & Abbas (2010) academia inspires knowledge creation and knowledge transmission, and academic libraries have been found to play a key role in supporting organizational activities. Additionally, knowledge development and information explosion encourages innovative methods in respect of the management and implementation of the right to knowledge (Ifijeh, 2010).

Mosha (2017) has outlined the use of KM in academic libraries by stating that KM within academic libraries is not only concerned with the management and/or systematic arrangement of journals, books or the organization of the flow and exchange of materials, but that it also involves the improvement of organizational knowledge that is possible through enhanced KM practices and organizational learning. In view of this, different organizations including academic libraries have utilized KM practices for a number of reasons such as to improve the organization’s performance and problem-solving processes (Lin, 2014).

Librarians are viewed as creators of knowledge through their active role in content management, knowledge organization and the assessment of the reliability and validity of information derived from undisclosed sources. In addition, librarians present value sets that are essential to scholarly survival, and they also care more about the accessibility and
understanding of academic resources that are significant and relevant to different disciplines (Case, 2008).

2.1 Factors that Influence KM Practices in Academic Libraries

The literature reports a number of factors that are considered to have an influence on KM practices in academic libraries. According to Kumaresan (2010), technological factors are significant in determining whether or not there is a need to use advanced software in academic libraries as opposed to simply utilizing the available and existing technology in implementing KM practices (Ali, Sulaiman & Cob, 2015; Jennex & Olfman, 2006).

Structural organizational factors which include decentralization limits, hierarchy and permeability of borders between roles, divisions and sectors, influence the practice of KM in academic libraries (Hasgall & Shoham, 2008). Other factors include KM strategies needing to be implemented in line with library objectives and strategies (Dulipovici & Robey, 2012). A well-designed implementation of knowledge-based strategy (Daud & Hassan, 2008) as well as committed and strong leadership from the topmost management (Kumar, 2010; Abokhodiar, 2014) are important for successful utilization of KM in academic libraries.

Various other factors have further been identified in relation to the sharing of knowledge and the shaping of individual behavior. These factors touch on user satisfaction (e.g. Panigrahi, Zainuddin & Azizan, 2014), employee motivation (e.g. Ali, Sulaiman & Cob, 2015; Abokhodiar, 2014), positive group behavior (e.g. Mamta & Jayanthi, 2012), individual behavior (e.g. Gautam, 2012) and the policies of the organization (e.g. Agarwal et al., 2012). Employee training is also considered an important factor as it helps sensitizing employees to the importance of KM in organizations and particularly in academic libraries (Pham & Hara, 2009).
2.2 Organizational Culture

Organizational culture is composed of corporate beliefs, individual behaviors, individual beliefs and organizational decision-making process, organizational tasks and hierarchy (Martins & Meyer, 2012).

The implementation of the practices of KM is in constant need of culture-related changes, as such, KM strategies should start from the top management of the organization, which includes modifying the organizational culture. In understanding cultural changes, organizations are able to better understand people’s behavior, the reason as to why it it proves difficult to change organizational settings and the forces that define people (Schein, 2010). The successes of KM is closely related to aspects of organizational culture such as, learning from failures and mistakes, innovations, team work and orientation and collaborations (Wong, 2008).

Organizational culture is important in the institutionalization process according to Gonzalez and Martins (2017). In this view, culture comprises organizational knowledge that is acquired through beliefs and values that are perceived to be authentic across different groups and people. Organizational culture brings together knowledge through routines, hierarchy and patterns (Levy, 2011; Martins & Meyer, 2012). Thus, insofar as organizations are in constant need of knowledge, the need for competence and essential skills to move on with the dynamics of improving and utilizing the practice of knowledge should be embedded in their organizational cultures (Klepić & Madžar, 2017). Organizational culture that is positively acquired is fundamental in the promotion of learning, knowledge sharing and improving skills (Boh et al., 2013; Irani et al., 2009).

The scarce funding for libraries has become one of the reasons for the poor knowledge management of the libraries. Many libraries have also identified the lack of knowledge
management to be one of the technological issues. Some of the key factors that have led to the lack of knowledge management in libraries include the lack of top management leadership support, lack of policies for human resource, lack of compensation schemas, lack of technology use and the lack of collaboration.

2.3 KM Strategy

Many companies use knowledge strategies based on the capacities and resources that are available to them (Schiuma & Carlucci, 2012). The process of KM includes the level at which a company is able to share, establish and utilise knowledge-related resources within the functional organizational boundaries (Chang & Chuang, 2011). Also, an organization needs to devise an effective structural system that is able to capture and transmit internal knowledge and related practices so as to enhance the establishment of strategies in KM (Oluikpe, 2012; Jasimuddin, 2008). The following KM strategies have become some of the most appropriate and best methods in organizational performance:

2.3.1 Codification Strategy

The codification strategy method enables organizational employees to access and retrieve knowledge that is codified and allows them to share or disseminate the knowledge through electronic gadgets. In this way, the codified form of knowledge is re-used, improved and refined to form an organizational novelty (Zanjani et al., 2008).

2.3.2 Personalization Strategy

The strategy of personalization is basically a person – to - person method and provides customized practical services from organizations that are perceived to have solutions that are optimized to address distinct solutions (Zanjani et al., 2008).
2.3.3 Integrated Strategy
A study by Sarawanawong et al. (2009) suggested the implementation of a KM strategy that conceptualized a hybrid framework for development in academic institutions. The integrated strategy is composed of the personalization strategy and the codification strategy (Choe, 2011). The personalization strategy has a human perspective where individuals play key roles while the codification strategy involves supporting roles and interaction between people and documents (Zanjani et al., 2008). The combined (integrated) nature of this KM strategy makes it more effective in ensuring better implementation of KM practices (Tseng, 2010).

3.1 Information Communication Technology (ICT) and KM in Academic Libraries
ICT plays a significant role in KM, especially in the current knowledge economy. This is because, prior to the employment of the concepts of ICT, the management of both explicit knowledge and tacit knowledge had been experiencing challenges related to knowledge processing, acquisition, storing and retrieval, fatigue of library professionals based on their work volumes and limited forms of motivation on the part of library organizations that led to low drive and unwillingness to achieve effective organizational performance (Enakrire and Ocholla, 2017). Thus, for the implementation of the concepts of ICT for KM to be effected, there is a need to observe the necessary strategies of management practices in academic libraries so as to these enhance KM processes (i.e. knowledge creation, acquisition, storage, dissemination, etc.).

Professionals in information and library management have now become organizers of library services and resources, through the facilitation of seminars and workshops, and are no longer viewed as guardians of knowledge and information (Ridwan 2015). In addition, most librarians have embraced new practices and approaches in information and KM through the utilization of modern tools of ICT and active involvement in training programs.
4.1 The Failure Factors and Problems of Adopting KM Practice in Academic Libraries

A number of factors have been identified in the literature as leading to the failure of KM practices as well hindering the adoption of KM concepts in academic libraries. These factors are important for consideration by organizations, particularly academic libraries. One of the failure factors is misalignment of strategic KM practices by organizations and academic libraries (Dulipovici & Robey, 2012). Based on the findings of Dulipovici and Robey (2012), KM practices need to be strategically aligned to the strategies of the organization or academic library. Other failure factors have been outlined by Pham & Hara (2009), which include the lack of a strategic framework and appropriate technological concepts for KM practices in academic libraries. Other factors include limited or total lack of awareness of the importance and benefits of KM, which may hinder the adoption and implementation of KM practices in academic libraries (Abokhodiar, 2014). Lack of or limited employee incentives is an additional failure factor according to Abokhodiar (2014), as employees tend to lack the motivation to actively participate the practices in KM and organizational knowledge.

Additional failure factors and problems in adopting KM practices in academic libraries include: over-reliance on technological factors as the fundamental and only solution to an organization’s KM; lack of organizational acceptance and fit; lack of understanding of the key limitations and roles of KM practices; limited or total lack of commitment and support from the organization’s topmost management and failure to determine the actual needs of the organization (Frost, 2014).

It is revealed that ICT tools have been widely in effective use for the achievement of competitive advantages and to make complete improvement in the services and its quality to attain the increasing innovations using the proactive management approach and have the successful utilization for the knowledge assets within the libraries. The KM adaptations by the libraries has also given birth to mange challenges.
5.1 Conclusion

This developmental paper attempted to provide a concise overview of the concept of KM as studied previously within the context of academic libraries. In the literature KM is presented as significant in shaping academic libraries to be knowledge and information seekers as well as providers. This is coupled with the view that academic libraries have a primary role as the fundamental medium of disseminating knowledge and acting as a repository for knowledge (Kim and Abbas, 2010). The exploratory nature of this study allows for an in-depth examination of the factors that affect KM practices in academic libraries especially in relation to the three main factors presented here, namely: KM strategy, organizational culture and ICT infrastructure. These factors along with failure factors as they occur in the specific context of academic libraries demand more attention especially given the limited number of studies and literature in this area.

The literature review has revealed that the libraries also need to make more wide use of ICT tools in order to support their overall decision making process and having more information communication. This shows that libraries have also been greatly influenced by the use of digital revolution and technology use along with the information scientists make use of technology like the external knowledge repositories (theses and academic journal articles etc.) and other integrated libraries to support their open downward and upward communication. The team based structure of organization is not widely been adopted within the libraries. The knowledge is also not being backed up by the reward schemas existences.
References:


Abstract

Over the last decade self-service portals into Human Resources (HR) systems have become ubiquitous across organisations with significantly-sized workforces. These enable employees to perform administrative tasks that traditionally were the responsibility of workers situated in the personnel or HR function of an organisation. The lack of research into the impact of recent innovations in web-enabled HR system upon workforces has been noted in the HR literature. As such, there is a gap in this literature pertaining to the worker experience of using self-service portals, and critically-minded evaluations of the impact of self-service HR on organisational cultures and structures. Our research will look into this gap by interviewing various stakeholders in two higher education institutions.

Keywords: HRM systems, self-service systems, case studies, Higher Education

1.0 Introduction

Over the last decade self-service portals into Human Resources (HR) systems have become ubiquitous across organisations with significantly-sized workforces. These enable employees to perform administrative tasks that traditionally were the responsibility of workers situated in the personnel or HR function of an organisation. They started to emerge at the turn of the century with an initial emphasis on information provision, specifically employees being expected to find information on corporate intranets rather than contact the HR function (Filipczak et al., 1997; Shugrue et al, 1997; Pelham, 2002). It is only in the last decade that interactive HR self-service portals, through which employees both record and retrieve information from an organisational HR database, have become commonplace in larger organisations (Reddick, 2009; Lin, 2011; David, 2014; Davis and Luiz, 2015; Cascade, 2018a). These have enabled ‘the HR function to be done differently’ (Kavanagh and Johnson, 2018:9), changing the relationship between HR, employees and managers (Gueutal and Falbe, 2005) by, for example, mandating employees to directly record their personal information onto the organisational HR database, book themselves onto training courses, and retrieve their own payroll information.

The lack of research into the impact of recent innovations in web-enabled HR system upon workforces has been noted in the HR literature (Francis et al., 2014). As such, there is a gap in this literature pertaining to the worker experience of using self-service portals, and
critically-minded evaluations of the impact of self-service HR on organisational cultures and structures. As Francis et al. (2014:1330) note, the discourse concerning the framing of contemporary technological solutions for HR practice (commonly referred to as e-HR) has largely been led by consultants and ‘characterised by functional concerns about improving the quality and efficiency of HR services.’ As Ruël et al (2006:4) argue, such consultancy dominance of the discourse concerning web-based HRM tools has led too much being claimed about advantages without offering convincing evidence.

2.0 Literature
Consultancy firms, rather than academics have been behind the first attempts to investigate whether the efforts put into e-HRM lead to the expected outcome, but these assessments tend to have a non-objective air.

There has similarly been a dearth of academic research or commentary on self-service HR systems in the Information Systems (IS) literature. A notable exception is Yang et al.’s (2011:221) research into Employee Relationship Management (ERM) systems ‘designed to provide access to benefits and other important employee services.’ ERM systems are designed with similarities to Customer Relationship Management (CRM) systems, adopting the ideological framing of normative service management practices that employees be ‘managed’ by organisational service functions, such as HR, as ‘internal customers’ (Berry, 1981). They are thus based on the premise of employees being similar to customers in respect to it being important for an organisation to have a single point of interaction with its stakeholders. An important feature of such systems is that they encompass ‘employee self-service and automated transactions with the corporate HR Department’ (Yang et al., 2011:223).

Alongside the rhetorically-expressed voices of consultants, often concealing particular vested interests, other dominant voices of positivity concerning the introduction of new technologies into the realm of HR are those of the providers/vendors of web-based HRM systems. For example, one such company, Frontier (2018), rhetorically point to self-service HR being transformational:

Designed to reduce HR administration costs… Employee and manager self-service transforms the HR function by moving time-intensive, administrative tasks away from your organisation’s centralised HR office and devolving responsibility to your staff.
In line with long-standing arguments in both the IS literature (DeSanctis, 1986; Yang et al., 2011) and the HR literature (Shugrue et al. 1997; Huang and Martin-Taylor, 2013) concerning HR information systems (HRISs) generally, another software company, Cascade (2018b) make the rhetorical argument that ‘by devolving responsibility… you free up resource within the HR team to undertake more strategic-value-adding tasks.’ We might perhaps readily recognise here that this rhetorically-expressed benefit conceals a coded managerial message that the software might also enable organisational management to decide to save costs by reducing the headcount of its HR function. Indeed, web-based HRIS (i.e. e-HR) initiatives tend to be driven cost-saving arguments (Parry and Tyson, 2011), and as Yang et al. (2011) explicitly argue about self-service HR functionality: it ‘provides managers with a means to reduce personnel costs and overhead by substantially automating what has traditionally been a critical but labor-intensive process in the firm.’ Other benefits rhetorically claimed for self-service HR by the same company in a white paper (Cascade 2018a), without any evident data, are more dubious. For example:

You can expect to achieve… employee engagement, which helps to improve well-being and create a sense of loyalty [and] sense of ownership over personal information and tasks, which should have a positive motivational impact. This rhetorical jump from efficiency to employee motivation, unsupported by any evidence, is mirrored in the discussion section of Yang et al’s (2011) study of employee self-service systems: Employees enjoyed direct and immediate self-directed access to their personal benefits and compensation information; this will likely result in the high degrees of satisfaction, which can translate into important motivation, performance and job tenure benefits for the firm.

Via diffusion of this discourse of positivity, an assumption has been swiftly institutionalised that the shift to self-service HR administration is unquestionably beneficial with any negative consequences irrelevant for managerial concern. This study thus responds to the lack of a critical perspective to this dominant discourse, by considering what identifiable problems there might be as a consequence of a shift from a human-relational model of HR to a technology-mediated model (Francis et al., 2014)

While it might be a fair assumption that savings may be made in terms of the cost of an HR function as work is shifted away from it, the overall financial cost: benefit to the organisation may be more problematic to calculate given that the HR activities transferred within the organisation. And yet, no attention has been paid to this concern in the literature. Recognising that a driver for the widespread diffusion of HR self-service systems may potentially be an uncritical ‘rhetoric of success’ (Zbaracki, 1998), our study seeks to critically explore via
qualitative methods how HR self-service systems have been experienced by those upon whom they have been imposed: organizational employees and their line managers.

In addition, the focus of Huang and Martin-Taylor’s (2013) study was on how organisations might ensure that employees use the HR self-service system, and thus accept the shift of HR labour to them. In contrast, our study seeks to explore the experience of employees to reveal something of the hidden costs and issues relating to the redistribution of HR work via the implementation of self-service HR systems. Thus, the important voices of the workers who are tasked with performing HR activities following implementation of self-service HR systems might be added to the discourse, potentially acting in a pro-organisational fashion as a counter-perspective to uncritical perspectives offered by software vendors, and others with vested interests.

Western universities have embraced the self-service HR portal as a key component of technology-enabled HR strategy (Stone and Dulebohn, 2013) such that they are now ubiquitous within the sector, implementing them with variable functionality. As such universities provide suitable exemplar study organisations to enable an exploration of the effects of the labour shift from the corporate HR function to individual employees situated across the organisation and ranging from low skill, low-wage, workers (e.g. cleaners, ground staff) to high-salaried knowledge workers in senior academic and senior management roles.

3.0 Methodology

This research presented here adopts a case study approach. Case study research is a broad concept and evidence can be collected in a variety of ways, ranging from structured interviews to active participation with the subjects being studied. The greatest advantage of using a case study is the opportunity to provide a comprehensive understanding of the issues under investigation. Case studies are used in situations where the researcher wants to contribute to the body of knowledge of individual, organisational, social or political related phenomena, which is clearly the case in the area of self-service systems’ impact on organisations.

A series of semi-structured interviews will be conducted across two HE institutions. The interview questions that will be developed will be revised and refined in an iterative manner as further interviews will be conducted. We endeavour to conduct approximately 20 interviews with various employees in both institutions. We will be interviewing academics, administrators as well as support staff who have to engage with the self-service system.
regularly, either as a line manager or as an individual. Template analysis will be used to analyse the interview data. This will involve the coding of the text so that segments of a particular theme can be assembled in order to complete the interpretive process.

4.0 Conclusions – Next Steps

The assumption of cost savings can perhaps be seen as indicative of success of consultancy rhetoric and the marketing strategies of self-service HR software providers. At face value the logic of reducing the labour costs of the organisational HR function as a ‘cost centre’ is alluring from the strategic management perspective. A common rhetorical logic of the self-service system is one of shifting labour costs away from a cost centre, thus removing those costs from consideration. For some self-service systems the labour is shifted outside of the organisation: for example, systems that support IT users in resolving their own IT incidents. But in the case of the HR self-service system the labour is, to some extent, shifted across the organisation. That is, tasks that might have been performed by HR personnel, or involved HR personnel, will, following implementation of self-service HR be exclusively performed by employees.

Clearly the time spent doing their own HR work cannot also be spent by employees on their core activities for which they are employed, and consequently they might resist taking on the additional work (Olivas-Lujan et al., 2007). This suggests that it might be pertinent to take a broader perspective on the implementation of self-service HR such that, for example, hidden costs of opportunity loss and/or costs associated with work intensification (e.g. increased absence and staff attrition), might be brought into the analytical focus. There is thus a gap in the literature for an academically robust study that critically considers whether self-service HR systems as implemented are managerial mechanisms by which HR functions might be downsized and the work of the body of employees incrementally intensified as they are given additional HR responsibilities (i.e. those shifted from the HR function).

Our study will therefore seek to gain a better understanding of the impact that HR self-service systems have on organisations. The initial pilot study has shown that there is a diversity of opinions between how these systems are used instead of how they should be used according to an academic and an administrative staff member. Also the pilot study shows an adverse impact on the relationship between line managers and their subordinates as the human contact has been minimised and it has been replaced by the system. Communications nowadays take place through the automated system rather than face-to-face. These initial findings show that
these systems are more complex than originally perceived and they are certainly the source of a number of issues rather than just the holy grail of efficiency and effectiveness as consultants tended to claim. Our research will look into these aspects in greater detail in order to shed more light in the area of HR self-service systems and their unintended consequences.

5.0 References


Cascade (2018b) Employee Self Service Module [webpage]. Available at: https://www.cascadehr.co.uk/hr-software/employee-self-service/ . Downloaded 5th December, 2018.


DEVELOPING VIRTUAL DATA WAREHOUSE FOR REHABILITATION REGISTRY IN SABAH, BORNEO: TOWARDS BIG DATA ANALYTICS AND GEOMAPPING

Research-in-progress

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Abstract

Clinical registry, defined as an organised system for the collection, storage, retrieval, analysis, and dissemination of information on individuals with a condition that predisposes to the occurrence of a health-related event, are designed through data repository or data warehouse. Data repository is described as a real-time database that consolidates data from a variety of clinical sources that offers a comprehensive source for storage and retrieval of relevant clinical information needed. However, data warehouse is a data repository that concentrates on data queries and data analytics. Rehabilitation registry in Malaysia is still at its infancy with lack of data sharing and integration. As rehabilitation is a subspecialty concerned with the prevention, diagnosis, and rehabilitation of disabling conditions, a registry would allow identification of patients’ demographics, clinical and functional outcomes improvement, benchmarking the delivery of rehabilitation services, and research purposes. The application of virtual data warehouse, cloud computing, big data analytics and geomapping for clinical registries have been implemented well in countries like China and United Kingdom. The main objectives of this research-in-progress paper are to demonstrate the feasibility of developing and designing virtual data warehouse framework based on cloud computing technology, in an attempt towards big data analytics and geomapping implementation for inpatient rehabilitation registry in Sabah, Malaysia.

Keywords: Rehabilitation Registry, Virtual Data Warehouse, Big Data Analytics
1.0 Introduction

In the wake of evidence-based medicine, a significant rise of data repositories is observed globally leading to the development of thousands clinical registries. Clinical registries are defined as “an organised system for the collection, storage, retrieval, analysis, and dissemination of information on individual persons who have either a particular disease, a condition that predisposes to the occurrence of a health-related event, or prior exposure to substances (or circumstances) known or suspected to cause adverse health effects” (Gliklich, Dreyer & Leavy, 2014). Clinical registries are designed through the development of data repository or data warehouse. Abdelhak et al. (2014) described data repository as "a real-time database that consolidates data from a variety of clinical sources to present a unified view of a single patient that offers a comprehensive source for storage and retrieval of relevant clinical information needed". On the other hand, data warehouse is a data repository that concentrates on data queries (e.g. Online Analytical Processing (OLAP)) and data analytics (e.g. descriptive and prescriptive analytics) (Chandra, & Gupta, 2018).

The numbers of rehabilitation registries are increasing exponentially for the past decade, not only focusing on data repository but aptitude for big data analytics while serving as a health educational platform. Rehabilitation registry in Malaysia is still at its infancy with lack of data sharing and integration. Rehabilitation medicine is a subspecialty concerned with the prevention, diagnosis, treatment and rehabilitation of disabling conditions including stroke, spinal injury and traumatic brain injury. Rehabilitation registry allows accurate identification of patients’ demographics, clinical and functional outcomes improvement, benchmarking the delivery of rehabilitation care services (New, Simmonds & Stevermuer, 2011), and serves as the platform for research purposes.

In the absence of a clinical registry, data on rehabilitation population’s demographic, disease complications, and rehabilitation outcomes are not accurately visualised to justify the allocation of health resources and funding. In this research-in-progress paper, we proposed to design and develop virtual data warehouse framework based on cloud computing technology, in an attempt towards big data analytics and
Developing Virtual Data Warehouse for Rehabilitation Registry

ggeomapping feature for supporting the inpatient rehabilitation registry in Sabah, located in northern Borneo, Malaysia.

2.0 Literature Review

The state of registries is highly advanced in developed countries as such the platforms for data repositories incorporated big data analytics, research databases and educational tools. For example, in the UK, data registry from Global Burden of Diseases Injuries and Risk Factors Study (GBD, 2010) was further utilised to scrutinise the patterns of health loss and the leading preventable risks (Murray et al., 2013).

Advancing Information System (IS) technology with simultaneous improvement of the healthcare system in developing region has resulted in increased development of clinical registries. The China National Stroke Registry is a nationwide prospective registry initiated in 2007 aiming to evaluate the delivery and quality of stroke care (Wang et al., 2011). Indians’ National Cancer Registry Programme was developed in 1981 for epidemiological studies and developing human resources for planning and monitoring cancer control activities (Rath & Gandhi, 2014).

Clinical registries in the field of rehabilitation medicine have evolved significantly for the past decade since the introduction and commendation of using World Health Organisation International Classification of Functioning, Disability and Health (ICF) framework that recognised the needs to identify and quantify disabilities (Stucki, Reinhardt, Grimby & Melvin, 2008). Model Systems Knowledge Translation Center at American Institute for Research has developed comprehensive physical medicine and rehabilitation databases that not only include registries for traumatic brain injury (TBI), spinal cord injury (SCI) and burn, but also generate up-to-date big data analytics and concurrent health information resources for patients.

In Malaysia, rehabilitation registry is not fully established across the nation. Having a registry allows contextual identification of benefits and barriers encountered in the provision of rehabilitation services leading to an accurate number of disabilities, better allocation of rehabilitation resources and research potentials. Thus, initiating
Developing Virtual Data Warehouse for Rehabilitation Registry

rehabilitation registry would be one of the first initiatives to bring forward this field into industrial revolution within the country.

Data repository terminology is often used interchangeably with the data warehouse to describe a collection of clinical data from various sources. Payne (2011) has defined the data repository as “a database that is optimised for storing and viewing clinical information sent over interfaces from departmental systems”. Abdelhak et al. (2014) subsequently described the data repository as "a real-time database that consolidates data from a variety of clinical sources to present a unified view of a single patient that offers a comprehensive source for storage and retrieval of relevant clinical information needed". On the other hand, the data warehouse is a data repository that concentrates on data queries (e.g. Online Analytical Processing (OLAP)) and data analytics (e.g. descriptive and predictive analytics) (Chandra, & Gupta, 2018; Golfarelli & Rizzi, 2018). One of the major roles of rehabilitation registry is focused on analysing the collected data as an attempt to produce patients’ health care profile and benchmarking rehabilitation care received through descriptive and inferential statistical analytics.

Generally, the data warehouse can be categorised into two main types: 1) virtual data warehouse and 2) distributed data warehouse. Virtual data warehouse refers to layers of databases that sit on top of existing databases to permit users in the query of the whole databases as if they are a single entity (although these databases are logically and physically separated) (Golfarelli & Rizzi, 2018; Maity et al., 2018). Distributed data warehouse, on the other hand, refers to the physical architecture of a single database. Distributed architecture usually includes clusters of 2 or more nodes and mostly enables efficient separation of computing resources to support concurrent operations (Chandra et al., 2018).

Theoretically, constructing virtual data warehouse is feasible but the main downside is the query performance of the virtual environment upon demand of queries across data from different layers of databases. In the advancement of IS technology, such downside is overcome by cloud computing technologies (Barkhordari & Niamanesh, 2018; Chandra et al., 2018). This research-in-progress paper seeks to design a virtual data warehouse framework based on cloud computing technology for supporting the
development of inpatient rehabilitation registry in Sabah, Malaysia. This virtual data
warehouse framework serves as the platform towards implementation of big data
analytics and visualisation using geomapping feature.

3.0 Virtual Data Warehouse Development Methodologies

The methodology of developing a virtual data warehouse for inpatient Rehabilitation
Registry in Sabah consists of 4 main phases as illustrated in Figure 1.

3.1 Phase 1: Problem Formulation and Preliminary Data Requirement
Investigation
Sabah is located in northern Borneo and has various population and geographical
distributions. Inpatient rehabilitation facility in Sabah is situated at the largest tertiary
hospital in its capital state, Kota Kinabalu. Ward admission is based upon non-pre-
emptive priority with capacity to accommodate 26 beds. Patients’ demographics,
clinical information, outcomes assessments and inpatient progress are all recorded and
date stamped in inpatient medical files. These files are kept in the hospital’s medical
record office.

In developing a virtual data warehouse, it is necessary to understand user
requirements from database users (i.e. rehabilitation medicine team members). Main
objective of this phase is to investigate data behaviours and access patterns, data
queries and Online Analytical Processing (OLAP), as well as data analytics
requirements of Sabah’s inpatient rehabilitation services. Due to the heterogeneity of
data sources, qualitative research methods such as interview, questionnaire and
observation are applied in this phase.

3.2 Phase 2 – Data Collection and Requirement Analysis
Following an agreement with the studied hospital, the data collected is further
analysed in order to identify the data requirements, business process and query
practices, as well as desirable visualisation report condition. Several data analysis
tools and feasibility studies are conducted to achieve the objective of this phase.
Outcomes from requirement analysis are further documented as a narrative story.
3.3 Phase 3 – Data Warehouse Framework Design

Based on the analysed data and business requirements, developing the virtual data warehouse involved designing cloud and virtual data warehouse architecture, data repository and metadata, OLAP, system user interface (UI) and report visualisation. The storyboard, data flow diagram (DFD) and flowchart diagram are used to communicate with the end-users.
Developing Virtual Data Warehouse for Rehabilitation Registry

3.4 Phase 4 – Data Warehouse Development & Testing

3.4.1 Prototype and Incremental Development
Developing a virtual data warehouse prototype for the inpatient rehabilitation registry is implemented with the incremental development approach. Regular scrum meeting is conducted to obtain user feedback on the developed prototype for incremental improvement until an acceptable prototype is developed according to user requirements.

3.4.2 Data Queries Implementation and Report Virtualisation
Following deployment of the virtual data warehouse on the cloud computing platform, OLAP data queries and report visualisation are further implemented and tested for big data analytics and geomapping. Concurrent regular scrum meeting with user is conducted for feedback followed by several testing including integration testing and deployment testing. Performance efficiency of queries implementation and report visualisation such as processing time and storage capacity are further recorded and benchmarked.

3.4.3 Performance Evaluations and User Acceptance
The proposed prototype is evaluated using the System Usability Scale (SUS) approach for measuring the performance and user acceptance.

4.0 Summary
The preliminary result of this research-in-progress paper has shown that rehabilitation registry in Sabah is still in the infant stage, which lack of data sharing and integration. The utilisation of the advanced Information System (IS) technologies including data warehouse based on cloud computing and implementation of big data analytics and geomapping visualisation are proven to be advantageous in supporting the management of data repositories in several countries such as China and United Kingdom. Subsequently, this study investigated the feasibility of developing a virtual data warehouse for inpatient rehabilitation registry in Sabah, Malaysia.

The result has shown that cloud computing can be further adapted to construct a virtual centralised rehabilitation registry. The tradition on-premises rehabilitation registry systems might not be applicable well in Malaysia as the country is divided into two main regions: the Malay Peninsular and the island of Borneo, whereby Sabah
is located in the latter region. Future work of this study involves developing a virtual data warehouse for integrating the heterogeneity of data repositories from several inpatient rehabilitation facilities in the country, subsequently expanded to support the big data analytics and report visualisation with geomapping feature.

References


STROKE REHABILITATION TREATMENT LINE PERFORMANCE: DISCRETE-EVENT SIMULATION LESSONS FROM QUEEN ELIZABETH 1 HOSPITAL

Research-in-progress

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Abstract
The application of Discrete-Event Simulation (DES) modelling in Malaysia is gradually increasing with the aim of decreasing inpatient treatment lines’ at public funded hospitals. Major premise behind this application is that such simulation models may be exploited in monitoring stroke treatment flows. The objective of this research-in-progress paper is to demonstrate the feasibility of applying DES modelling in understanding treatment line performance of stroke patients in a general inpatient rehabilitation ward at a major tertiary hospital in Kota Kinabalu, Sabah.

Keywords: Treatment Line Performance, Discrete-Event Simulations, Stroke Rehabilitation

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1.0 Introduction

Delivering inclusive, multidisciplinary rehabilitation interventions for inpatient care pathway has been shown to reduce death, dependency and institutionalisation among stroke patients (Bal, Ceylan & Tacoglu, 2017; Okazaki & Fatar, 2014). Provision of early inpatient rehabilitation in stroke improves final outcome, both neurologically and functionally. Many studies have argued that the best window period for early rehabilitation intervention is within the first 3-6 months post-stroke. Inpatient rehabilitation care is thus important and highly demanded in the background of increasing number of stroke survivors (Gul & Celik, 2018).

Multidisciplinary rehabilitation team members, therapeutic interventions and equipment are three major components of inpatient rehabilitation care. Key members include rehabilitation physicians, physiotherapists, occupational therapists, speech and language therapists, and nurses. In the state of Sabah, Malaysia, there is one dedicated inpatient Rehabilitation Ward catered for the whole state with multidisciplinary team members providing therapeutic interventions. As the ward is located in the largest tertiary hospital in Sabah, it accepts admission of stroke survivors within acute period (within one week post-stroke event). Given the high levels of uncertainty with such acute admissions to the inpatient Rehabilitation Ward, continuous change can severely affect patient outcomes, hence the need to understand the utilisation potentials of Discrete-Event Simulations (DES) modelling as a predicting tool in running the ward.

The obtainability of special-purpose simulation languages such as DES, of massive computing capabilities at decreasing cost per operation, and of advances in simulation methodologies have made simulation one of the most extensively used and acceptable tools in treatment flow planning and analyses (Soremekun, Takayesu & Bohan, 2011). Established applications of DES have been seen increasingly in the emergency department (ED), a department with high numbers of patients and multiple events occurring at the same time. Such developments are seen growing significantly in both developing and developed nations for the last ten years (Ahmed & Alkhmis, 2009; Ferreira, Coelli, Pereira & Almeida, 2008). Some of the applications of DES in ED include:
• Reducing emergency department overcrowding (Soremekun, Takayesu & Bohan, 2011).
• Verification of lean improvement for emergency room process (Yi, George, Paul & Lin, 2010).

In short, the general premise behind these studies is that such simulation models may be used to support the management of a department that consistently faces high overcrowding. In general, DES could be used for following purposes:
• The understanding gained during the designing of simulation model could be of value towards suggesting enhancement in the rehabilitation care pathway under investigation.
• Simulations could be used to test new rehabilitation policies prior to implementation, so as to formulate for what might happen.
• Simulation models designed for rehabilitation training make learning possible, without disrupting on-the-job instructions.
• Simulating different competencies for a rehabilitation equipment/device such as ultrasound modality could help determine its requirements.
• Clinical and departmental changes could be simulated, and the consequence of these alterations on the simulation model’s behaviour could be observed.
• Changing simulation inputs and observing the resulting outputs could provide valuable insights about which variables are important and how variables interact.
• Animation could show a rehabilitation treatment system in simulated operation so that the proposal could be visualised.

Many studies in the developed nations have shown the practicality of applying DES modelling as an instrument in management decision-making, especially involving systems that incorporate treatment lines including hospital wards (Ghanes et al., 2014). However, the core limitation of these studies was that they are contextual in nature. There is thus a need for those in other regions such as Malaysia to confirm (or falsify) what has been found in the previous studies.

The study of treatment lines is the primary objective of DES with the aims of defining certain parameters such as the length of the queue, that are relevant in circumstances
Discrete-Event Simulation for Stroke Rehabilitation

whereby the state of the system changes at discrete instants of time. For this reason, constructing DES modelling as a solution towards problems with treatment line system in public funded hospitals is increasing in the past decade targeted to enhance quality of healthcare provision (Soremekun, Takayesu & Bohan, 2011). Nevertheless, development of DES with specific aims in investigating patient treatment line performance and treatment flow as an effort to decrease waiting lines of rehabilitation ward to an acceptable level has not been explored in great depth in Malaysia.

This research-in-progress paper intends to explore the feasibility of constructing a DES modelling to understand stroke patient treatment line performance and treatment flow in a general inpatient rehabilitation ward at a tertiary hospital in Kota Kinabalu, Malaysia. The primary objective of this simulation approach is aimed at ascertained the length of the queue (i.e. length of stay, length of treatments’ duration).

2.0 Literature Review

Stipulation of rehabilitation interventions is influenced by availability of therapists and equipment. For example, interruptions in subsequent sessions with team members are anticipated as a result of under-manned staff in providing scheduled therapy to patients. It is thus imperative to appreciate inpatient treatment flow for stroke rehabilitation care and such objective could be explicitly observed through DES modelling. DES offers a credible method for assessment of capacity in a treatment line system, therefore creating ways in connecting industrial process reasoning towards healthcare improvement approaches. DES outcomes are analysed by numerical methods (i.e., considerable changes in the variables of system state are linked with events occurring at discrete time instances). Numerical methods use computational procedures to “solve” the mathematical models in DES modelling.

Moreover, presence of shifts in any of the points throughout the inpatient treatment flow could be detected with DES modelling. Such shifts may cause starvation and bottleneck effects that further delay therapeutic sessions (New et al., 2013). In short, major advantageous of DES modelling is that it integrates variations of patients’ intricacy, rates of admission and delayed discharges (i.e., variations of patients’ care pathway are expected based on each individuals). However, most DES modelling
studies were observed in developed countries that possessed advanced healthcare system. In a developing country like Malaysia, a preliminary work in exploring feasibility of constructing DES modelling as an attempt to explore determinants influencing long waiting time was developed at a tertiary hospital emergency & trauma department in Sabah state (Gan, Nasrin, Awang Piut, Kheng, & Azura, 2017).

Particularly for stroke inpatient rehabilitation care pathway, the development of simulation models generally remains limited. Intuition and simple average based estimates are routine practice in estimating treatment line performance. However, these methods lead to underestimating capacity requirements for staffing and equipment. Majority of nationally governed and public funded hospitals in Malaysia consist of general wards (i.e. wards that do not cater for subspecialties) and most of inpatient rehabilitation wards in the country accommodate various conditions such as stroke, spinal cord injury and traumatic brain injury. Hence, appreciating inpatient treatment flow within the local setting signifies the importance of contextual factors in provision of rehabilitation care.

DES modelling outcomes may be manipulated to improve ward capacity management that heavily influenced by the governing hospital policy and performance indicators, for instance bed occupancy rate (BOR) and length of stay (Kortbeek, Braaksma, Smeenk, Bakker & Boucherie, 2015). For inpatient rehabilitation, length of stay is guided by therapeutic goals determined at admission and such policies and indicators may potentially affect quality of care, patients’ progress and discharge.

3.0 Case Background

The inpatient Rehabilitation Ward is located at the largest tertiary hospital in Kota Kinabalu, Sabah. Admission to the ward is based upon non-pre-emptive priority and sources of admission are either directly from outpatient rehabilitation clinic and non-rehabilitation wards, or from other hospitals. The ward accommodates 26 beds and provision of rehabilitation services in this facility is governed by the needs to meet the minimum Bed Occupancy Rate (BOR) of 70%.
4.0 Research and Simulation Development Methodologies

Simulation development methodologies consist of 5 main steps that have and will be applied in developing both the research and simulations models.

4.1 Problem formulation and overall project plans

Treatment line topics essential for focus group interviews were developed following an agreement with the studied hospital focusing on stroke patients admitted to the Rehabilitation Ward. Topics were delivered to the ward in advance, allowing the model users (i.e., rehabilitation ward team members) sufficient time preparing for the interview. The research and simulation objectives were jointly established between the model users and the simulation modellers. Overall project plans and the model users involvement are two major key factors that influence the success at this stage. Enhanced likelihood of strong implementation is anticipated if the model users are heavily involved in the entire model-building process and appreciate the nature and functions of the DES model developed.

4.2 Model conceptualisation

The primary objective of the simulation exercise is to understand stroke patients’ treatment performance in the ward. For this purpose, two DES models are considered; 1) a single-server service node with immediate feedback and 2) a simple inventory system with delivery lag. The secondary DES objective is to formulate the treatment line discipline. To achieve these objectives, simulation modellers undertook non-participatory field observations and in-depth face-to-face focus group discussions with the model users. The main goal of focus group discussion is to develop an overall picture of the treatment line flow or commonly known as an ‘As-Is’ simulation model. Table 1 and Table 2 further illustrate admission to discharge tabulated tasks, and planned task on daily basis respectively, of a stroke patient in the rehabilitation ward.
## Table 1: Tabulated task from admission to discharge (inpatient stay for 14 days)

<table>
<thead>
<tr>
<th>Step</th>
<th>Task/Interventions</th>
<th>In-charged personnel</th>
<th>Time taken to complete task</th>
<th>Dependent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Admission clerking (once)</td>
<td>Nursing staff</td>
<td>30mins</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Admission clerking (once)</td>
<td>Medical officers</td>
<td>60mins</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Medical officer ward round – daily basis</td>
<td>Medical officers</td>
<td>10mins/day for 7x/week = 140mins</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Specialist round – daily basis</td>
<td>Rehabilitation Medicine Specialist</td>
<td>10mins/day for 5x/week = 100mins</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Medications (3x/day)</td>
<td>Nursing staff</td>
<td>15mins/day = 210mins</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Physical therapy session</td>
<td>Physiotherapist</td>
<td>30mins/day for 5x/week = 300mins</td>
<td>Inpatient gym</td>
</tr>
<tr>
<td>7</td>
<td>Occupational therapy session</td>
<td>Occupational therapist</td>
<td>60mins/day for 5x/week = 600mins</td>
<td>Inpatient gym</td>
</tr>
<tr>
<td>8</td>
<td>Caregiver training</td>
<td>Caregiver</td>
<td>60mins/day for 7x/week = 840mins</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Nursing &amp; hygiene care – (vitals monitoring 6x/day, hygiene care 5x/day)</td>
<td>Nursing staff</td>
<td>6x5mins/day + 5x20mins/day = 1820mins</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Discharge preparation (once)</td>
<td>Medical officers</td>
<td>60mins</td>
<td></td>
</tr>
</tbody>
</table>

## Table 2: Tabulated task (planned) on daily basis (weekdays)

<table>
<thead>
<tr>
<th>Time</th>
<th>Task/Interventions</th>
<th>In-charged healthcare personnel</th>
<th>Time taken to complete task</th>
<th>Dependent</th>
</tr>
</thead>
<tbody>
<tr>
<td>2am</td>
<td>Vitals monitoring</td>
<td>Nursing staff</td>
<td>5mins</td>
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<tr>
<td>6am</td>
<td>Vitals monitoring</td>
<td>Nursing staff</td>
<td>5mins</td>
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<tr>
<td>6.10am</td>
<td>Bladder &amp; hygiene care</td>
<td>Nursing staff</td>
<td>20mins</td>
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<tr>
<td>7.30am</td>
<td>Medication (morning)</td>
<td>Nursing staff</td>
<td>5mins</td>
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<tr>
<td>8am</td>
<td>Medical officer ward round</td>
<td>Medical officers</td>
<td>10mins</td>
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<tr>
<td>9am</td>
<td>Specialist ward round</td>
<td>Rehabilitation specialist</td>
<td>10mins</td>
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<tr>
<td>9.15am</td>
<td>Physical therapy session</td>
<td>Physiotherapist</td>
<td>30mins</td>
<td>Inpatient gym</td>
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<tr>
<td>10am</td>
<td>Vitals monitoring</td>
<td>Nursing staff</td>
<td>5mins</td>
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<tr>
<td>10.10am</td>
<td>Bladder &amp; hygiene care</td>
<td>Nursing staff</td>
<td>20mins</td>
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<tr>
<td>11.00am</td>
<td>Wound care</td>
<td>Nursing staff</td>
<td>20mins</td>
<td></td>
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<tr>
<td>11.30am</td>
<td>Caregiver training</td>
<td>Caregiver</td>
<td>30mins</td>
<td></td>
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<tr>
<td>1.30pm</td>
<td>Medication (afternoon)</td>
<td>Nursing staff</td>
<td>5mins</td>
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<tr>
<td>2.00pm</td>
<td>Vitals monitoring</td>
<td>Nursing staff</td>
<td>5mins</td>
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</tr>
<tr>
<td>2.10pm</td>
<td>Bladder &amp; hygiene care</td>
<td>Nursing staff</td>
<td>20mins</td>
<td></td>
</tr>
<tr>
<td>2.30pm</td>
<td>Occupational therapy session</td>
<td>Occupational therapist</td>
<td>60mins</td>
<td>Inpatient gym</td>
</tr>
<tr>
<td>4.00pm</td>
<td>Caregiver training</td>
<td>Caregiver</td>
<td>30mins</td>
<td></td>
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<tr>
<td>6pm</td>
<td>Vitals monitoring</td>
<td>Nursing staff</td>
<td>5mins</td>
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<tr>
<td>6.10pm</td>
<td>Bladder &amp; hygiene care</td>
<td>Nursing staff</td>
<td>20mins</td>
<td></td>
</tr>
<tr>
<td>9.30pm</td>
<td>Medication (night time)</td>
<td>Nursing staff</td>
<td>5mins</td>
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<tr>
<td>10pm</td>
<td>Vitals monitoring</td>
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<td>10.30pm</td>
<td>Bladder &amp; hygiene care</td>
<td>Nursing staff</td>
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4.3 Data collection and model translation
Based upon non-participatory observations and face-to-face interviews with the model users, triangulation of primary data collected offers substantial information on the presence of bottlenecks and starvations for constructing more realistic simulation model. These data collection methods are mutually supportive for understanding the model users’ ‘worldview’, permitting an in depth observation of the bottlenecks and starvations areas.

4.4 Verification and validation
Verification pertain to the computer program has been prepared for the simulation model while validation will be measured through the calibration of the simulation model, an iterative process of comparing the simulation model against actual system behaviour.

4.5 Model Implementation
Multiple runs of ‘To-Be’ models shall be developed to properly estimate the set key performance index of the ward, particularly for the stroke inpatient rehabilitation treatment flow designs. The success of the implementation phase depends on how well the previous steps have been performed.

5.0 Summary
DES modelling should be the preferred tool for problems solving, particularly involving systems with inpatient treatment line such as rehabilitation of acute stroke in a highly demanded tertiary hospital. DES may not be the only solution for the treatment line challenges faced by the ward, but DES assists in evaluating such challenges. DES modelling is not a total answer to the waiting line bottleneck and starvation challenges faced, but just a proposed simulation model that is innately appealing to many medical doctors and hospital administrators as it has a strong aptitude to fully mimic what happens in a real treatment line system.

Moreover, with significant levels of uncertainty, continuous change and where marginal operational understanding can affect patient outcomes, it is vital to let the department test changes in a risk and cost-free situation to identify and implement the
most practical solutions. We have proven that the simulation results not just revealed the performance of the existing treatment lines, but also helped the department to objectively visualise the effect on the performance of the treatment lines as result of addition or subtraction of manpower and other related resources. Consequently, a better projection and allocation of staffing can be made in advance.

References


Social media use in HR management; rule making, rule breaking and workarounds: a sociomaterial view

Abstract

Employees use alternative tools and technologies to modify existing routines such that shortcomings in organisational processes can be overcome by deviating from prescribed procedures. These practices are referred to as “workarounds” and present a recognised yet under-researched phenomenon. Our study investigates how employees use social media as tools for compensating for shortcomings of existing information technologies and the effects of these workarounds on the strength of the HR communication process. We present a multiple case study to demonstrate workarounds in large UK organisations and to describe the intended outcomes and undesired side-effects. We further suggest an extension to the established structurational model of technology to incorporate effects of workarounds and conclude with an outlook for further research. The findings further offer practical application in the HR field by demonstrating how social media can be adopted into the existing HR processes.

Keywords: Sociomateriality, Structuration, Workarounds, Social Media, HR Management

1 Introduction

Availability of a technology is not sufficient to lead to organisational transformation. Rather, it is how technology is used and applied in a specific context which results in the development of new capabilities, products and processes (Lucas Jr, Agarwal, Clemons, El Sawy, & Weber, 2013; Orlikowski, 2000; Park, Sawy, & Fiss, 2017; Parmigiani & Howard-Grenville, 2011). This paper continues the debate on sociomateriality of information technologies.

Social media, a “new class of information technologies” (Kane, Alavi, Labianca, & Borgatti, 2014, p. 275), requires a review of established strategic and organising approaches. In this paper, we present findings from an empirical cross-disciplinary study that has theoretical and practical implications.

This paper introduces a comparative case study in three organisations which exhibit different approaches to social media use. We analyse the practices and routines employed by the employees in the case organisations to circumvent existing barriers and to deviate from prescribed routines to achieve organisational goals.

We suggest that social media, offers qualitatively different capabilities from other internet-based communication technologies, enabling organisations to create and maintain relationships. We argue that establish models of technology use in
organisations require an extension to accommodate workarounds which are being made possible by the emergence, availability and persistence of social media. We find that organisational rules and policy have a moderating effect on the ability of actors to use the technology to build relationships. However, actors use workarounds to bypass organisational policy.

The research has theoretical and practical implications. From the theoretical point of view, we uncover existing and emergent practices (Huang, Baptista, & Galliers, 2013; Leonardi, Huysman, & Steinfeld, 2013; Stein, 2013). The practical implications arise from examples of how social media use can be strategically placed into business processes and lead to the development of capabilities (Sahay, Sein, & Urquhart, 2017). Employees are modifying organisational routines and use workarounds to eliminate shortcomings of existing routines (Alter, 2014; Feldman, 2000). We argue that social media provides employees with additional and novel ways to deviate from prescribed routines and policies to achieve organisational goals.

In this research, we investigate social media use in organisations in the context of human resource management (HR or HRM). The question under investigation is how employees use social media to deliver value for organisations. We start with an introduction of terminology and frameworks used in the study and provide a brief overview of the current state in social media research. Then, we present findings from three qualitative case studies in organisations with different approaches to social media use and highlight different approaches to social media use for workarounds. In the final section, we discuss the implications of the study and discuss opportunities for further research.

2 Workarounds and organisational routines

Organisational processes and routines, such as Standard Operating Procedures, are seen as a source of stability (Feldman, 2000). However, in a situation when restrictions and technologies prevent employees from “getting the work done” they employ workarounds to achieve their goals despite the shortcomings of idealised processes or insufficient IT support (Alter, 2014). The theory of workarounds has found broad recognition in recent management and IS literature (Alter, 2014; Ferneley & Sobreperez, 2006; Ignatiadis & Nandhakumar, 2009; Morrison, 2015; Spierings, Kerr, & Houghton, 2017). We develop our argument around the Structurational
Model of technology (Orlikowski, 1992). Technology restricts and facilitates human action and has an impact on the organisational setting (Figure 1).

Figure 1 – Structurational Model of Technology (Orlikowski, 1992)

The model assumes that human interactions with technology are restrained and enforced through organisational settings (arrow “a”). The technology itself is the outcome of human activity (arrow “b”). Human action such as design, development and implementation brought a technology into being. Once available, technology facilitates as well as restricts human action (arrow “c”). The interaction of human agents with the technology has a direct impact on the organisation’s properties reshaping or re-enforcing existing processes and structures (arrow “d”).

We argue that social media allow employees to deviate from the prescribed paths and patterns of technology use and to a) interact with technology in a qualitatively different way than that prescribed by the organisation and b) influence organisational properties while bypassing the organisationally prescribed and defined pathways. We are using the context of HR communications to demonstrate the effects on workarounds on organisational properties.

3 Social Media in HR Management context

There are several lenses to define HR Management (Guest, 2011). One of the lenses is that of HR as a communication system between management and employees (Ostroff & Bowen, 2016). The effectiveness of an HR system is derived from three main properties: distinctiveness and consistency of messages, and the existence of a shared understanding (consensus) between the managers and employees (Bowen & Ostroff, 2004; Sanders & Yang, 2015). Distinctiveness refers to the recipient’s perception of the importance of the message. A distinctive message “stands out” among other similar messages, e.g., because it comes from a trusted source, a close friend or a high-level manager. Consistency is understood both in a spatial and temporal context. In a spatially consistent HR process, similar messages are sent by managers at
different levels and in different departments. Consistency over time requires similar message content in job adverts, selection-, on-boarding-, promotion-processes, as well as dismissal. Consensus is achieved by strategical alignment across hierarchies and departments, as well as provision of feedback channels to ensure employee’s and management’s interpretation of the message content are consistent.

With this approach to HR communications, the organisation needs to maintain control over the communication media and limit the employees’ ability to speak or to create their own message. The ever growing penetration of social media tools and platforms of personal and business environments makes control of communication difficult if not impossible (Feuls, Fieseler, & Suphan, 2014; Huang et al., 2013). Social media changes the HR processes at individual and organisational levels (Table 1).

<table>
<thead>
<tr>
<th>Individual</th>
<th>Firm</th>
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<tbody>
<tr>
<td><strong>Process</strong></td>
<td>- Job search and “one-click apply” on LinkedIn vs adjusting CV and cover letter for each position, applying via application forms</td>
</tr>
<tr>
<td><strong>Relationships</strong></td>
<td>- Application Process on LinkedIn vs proprietary applicant tracking systems</td>
</tr>
<tr>
<td><strong>User Experience</strong></td>
<td>- Direct access to information and conversation with managers (e.g. CIO blogs)</td>
</tr>
<tr>
<td><strong>Markets (Information Consumption/Provision)</strong></td>
<td>- Direct access to candidates on LinkedIn vs proprietary candidate pools;</td>
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<td><strong>Target Audiences</strong></td>
<td>- Continuous alumni engagement vs irregular alumni events</td>
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<tr>
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<td>- Direct sourcing vs Agency Recruitment;</td>
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<td><strong>Target Audiences</strong></td>
<td>- Up-to-Date Skills and aspirations of current employees vs outdated information based on CV at the time of application;</td>
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<td>- Up-to-Date Skills and aspirations of current employees vs outdated information based on CV at the time of application;</td>
</tr>
<tr>
<td><strong>Target Audiences</strong></td>
<td>- Anonymous instant feedback on Glassdoor vs b-annual employee surveys</td>
</tr>
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Table 1 – Examples of HR Routines Changes through Social Media use

Previous studies have found that employees use “workarounds” to modify existing routines such that shortcomings in organisational processes can be overcome by deviating from prescribed practices (Feldman & Pentland, 2003). Our study investigates how employees use social media as tools for compensating for shortcomings of existing information technologies and the effects of these workarounds on the strength of the HR communication process.

4 Case Studies

This section describes the study design and findings. The descriptive findings from each case are summarised and discussed in the final sub-section.
4.1 Study Design

The case studies follow a multiple interview-based case study approach (Yin, 2009). The data was collected in the series of face-to-face or telephone interviews with employees in HR-related roles in three multinational organisations with headquarters in the UK. From a macro-level perspective, several environmental parameters such as availability of employees to hire, language and culture in the host country, regulations and employment laws, consumer base and expectations are “comparable”, although it is acknowledged that industry-specific factors can cause and explain some of the differences observed in the study. The data for the studies were collected in a series of in-depth interviews (Silverman, 2013; Yin, 2009) which were transcribed and analysed using a qualitative data analysis package NVivo. For the analysis the organisations were coded as “Country” + “Industry” + “Ordinal Number” (e.g., “UK FMCG 1”), as the three organisations presented here are from different industries, the ordinal number is omitted in this paper for readability. In some graphs and tables, the “industry” is abbreviated to allow better use of limited space.

The case organisations were selected based on their apparent activity on social media. The selection process aimed to identify organisations where employees privately and acting on behalf of the organisation demonstrate different behaviours. From a pool of 30 organisations, each organisation’s activity on Facebook, LinkedIn, YouTube, Twitter and the Organisation’s careers page was assessed. Organisations were scored on two dimensions: (1) organisation’s activity on social media, and (2) employees’ activity on social media (Figure 2). Based on the two dimensions, organisations were assigned one of the four quarters: “Social Organisation”, “Social Employees”, “Un-Social Organisation”, “Un-Social Employees”. The “Social Organisation”-quarter is characterised by active interactions on public social media between the organisation and its employees (e.g., firm posting job advert on LinkedIn and employees sharing it and adding comments). “Social Employees”-quarter included organisation where employees were active on social media, but the organisation itself was not (e.g., LinkedIn groups “xyz employees” ran by an alumnus had 10 times more current employees and ongoing posts versus a “dead” official LinkedIn group where the last post was made over a year ago). “Un-Social Employees”-quarter included organisations which visibly tried to engage but did not get (much comparing to others) response from their employees (e.g., LinkedIn groups where only the “organisation” posted, Tweets which were neither liked nor retweeted). Finally, “Un-Social
organisations”-quadrant included firms where activity from neither the organisation nor employees was visible (e.g., YouTube channel with 4-year-old videos and comments turned off, empty “official Facebook page” or tumbleweed-like Twitter accounts).

While at the beginning of the study it was not clear whether the same interaction patterns would be prevalent inside the organisations, these publicly visible interactions provided sufficient support for selecting the case organisations as candidates for study (Wolf, Sims, & Yang, 2015).

Figure 2 – Employee-Employer engagement levels for case selection

The cases in our study exhibited different interaction patterns on public social media, and it was expected that the value proposition, value creation, segmentation and internal interaction patterns would be different. Following the comparison logic (Eisenhardt, 1989; Rihoux & Ragin, 2009), the differences and similarities of these patterns should explain the different outcomes in the development of new capabilities and thus in contribution to the creation of competitive advantage. In UKBank, the interaction pattern was that of “social employees” – the employees interacted on social media, while the “organisation” in the form of official accounts was not visible. In UKOutsourcing, the pattern was that of “unsocial employees” – the organisation over official channels was much more active on social media than its employees. UKConsulting occupied the space of “Social Organisations”, where both the organisation and its employees do interactively post on social media platforms.
4.2 Findings and Analysis

Each organisation provides an insight into how and when workarounds were used by HR employees to deviate from the prescribed communication routines. We list the organisations in the order of their approach to social media use: discouraged by UKBank, encouraged with limited success by UKOutsourcing, and embraced by UKConsulting.

UKBank is an internationally operating financial services company. Most of the interviews were conducted in and with employees from the head office in London. The main tools used within the company are Avature (a customer relationship management-like system focused on broadcasting targeted information to large groups of people) for selection and attraction and an internally developed chat client for internal group or individual instant communication. Externally, LinkedIn is used differently by recruiters, employees, and alumni for attraction, broadcast and socialising.

UKOutsourcing is a services company with contracts in security, maintenance, and transport. The head office functions are distributed across the UK and employees from the South-East of England, London and Birmingham were involved in the study. An internal communication platform – Yammer has been recently introduced but is not being used for inter- and intra-team communications to the extent expected, with managers more active than employees. Externally, it is company policy to “monitor but not to engage” on Twitter.

UKConsulting is a technology consulting firm which concentrates on consultancy services in the HR technology space and is a part of a US-based group of companies. The study focused on the UK based part of the firm. UKConsulting makes a plethora of communication tools available for employees for content sharing and intra-company communication. The main tools used are an internal in-house Facebook-like tool “Networking” and LinkedIn.

4.2.1 Workarounds in UKBank

UKBank operates in a highly regulated environment. Operations relating to financial transactions are expected to be transparent and compliant with laws and regulations. However, the compliance extends to other parts of the business operations. For example, to ensure equal opportunities and fight corruption and nepotism, all recruitment-related communications need to be recorded transparently and follow a
defined process. Recruiters are not allowed to use LinkedIn or other communication media to engage with candidates. UKBank’s views social media as a vehicle for delivering controlled information. The value proposition for the employees is described as receiving “targeted, relevant and timely communications”. The problem with the internal applicant tracking systems (ATS) is that the data is stale and only candidates who have applied before can be found. Further, direct one-to-one communication between recruiters and candidates is not possible. UKBank’s recruiters, however, use their personal devices and accounts to source and contact potential candidates. Once relationships are established over LinkedIn, Skype and WhatsApp, and a vacancy has been “sold” to a high-potential candidate, they then are put into the “normal process” of applying through the sanctioned ATS.

4.2.2 Workarounds in UKOutsourcing

UKOutsourcing is a geographically dispersed organisation. With main offices located in several UK locations, teams are often distributed across multiple offices. UKOutsourcing places a focus on a consistent message across different parts of the organisation and encourages recruiters to use LinkedIn for Job-posting, attraction and searches using provided templates and tools. However, some recruiters feel that the corporate-approved templates are not attractive enough to capture the interest of the “right candidates”. Additionally, some recruiters feel that searches on LinkedIn are not returning appropriate results. Finally, responses to vacancy adverts on LinkedIn are considered “too opportunistic” and as such not adding value. The recruiters thus deviate from the prescribed procedures to do their job. Some interviewees reported that they rewrite the job offerings and turn them into word-clouds to create attractive “images” which represent the job specifications. These “appealing” job descriptions are then posted on LinkedIn via the recruiter’s personal profile. Other recruiters do the required minimum of posting the job adverts onto LinkedIn and use other (more familiar) search engines to source candidates and direct phone calls to establish contact (rather than connecting to candidates on LinkedIn).

4.2.3 Workarounds in UKConsulting

UKConsulting considers itself a “social media company”. The employees receive a “social score” based on their engagement on internal social media platforms and this score drives a portion of their bonuses. Social interaction on inter/ and intranet has a
direct monetary value attached to it. The main platform used in UKConsulting is “Networking” – a LinkedIn-like application which allows one-to-one and group interactions between employees, customers and partners. One of the features of “Networking” is the Q&A section where anyone can ask the community for help. The issue with these Q&As are that the become “ghost towns” in which questions remain unanswered. This apparent silence results in frustrations, and a “why bother” attitudes. UKConsulting’s employees use public forums (notably customer community on LinkedIn) to ask and answer questions. Interestingly, the willingness to contribute to Q&As on the LinkedIn group is reported to be higher than that on the internal platform. However, UKConsulting is not discouraging this behaviour and contributions to “unsanctioned” social media do count towards the employee’s social score.

4.3 Discussion
In all three organisations, we discovered employee’s behaviours and interactions with technology which do not comply with those prescribed by the organisation. In all cases reported, the intent was to “do my job” or to “get better candidates”. Employees were aware that their interactions with technology deviate from sanctioned paths. However, they believed that these deviations are benefitting the organisation as a whole. The reasons for non-compliance were consistently altruistic. The patterns of workarounds vary in each organisation as do the organisational responses to the workarounds (Table 2).
UKBank modified some of its rules and procedures to accommodate the workaround. UKOutsourcing, on the one hand, provides additional training to encourage employees to follow the prescribed procedures; On the other hand, the organisation “turns a blind eye” on the workaround, allowing it to take place. UKConsulting has modified its policy and has institutionalised the workaround fully embedding it into their standard practice.
<table>
<thead>
<tr>
<th>Case Organisation</th>
<th>Situation</th>
<th>Workaround</th>
<th>Aim</th>
<th>Organisational learning</th>
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<tbody>
<tr>
<td>UKB</td>
<td>All recruiter-candidate communication must be logged in a centralised system. Access to LinkedIn is blocked from firm-network</td>
<td>Rule breaking: personal devices to source candidates on LinkedIn</td>
<td>Attract better candidates for the organisation</td>
<td>Recruiters in some departments in the UK are now provided with “recruiter licenses” and are allowed to put certain jobs as applications through LinkedIn directly</td>
</tr>
<tr>
<td>UKO</td>
<td>Recruiters must use approved Job-templates to post on LinkedIn. They must use LinkedIn for direct sourcing</td>
<td>Workaround: personal accounts used to post modified adverts. Alternative search engines used for search</td>
<td>Better engagement with the candidates. Better matching of candidates to jobs</td>
<td>Additional training provided to recruiters on how to use LinkedIn searches. Personal re-posting of vacancies is tolerated</td>
</tr>
<tr>
<td>UKC</td>
<td>Employees are encouraged to engage on the internal platform to share knowledge and participate in Q&amp;A sessions</td>
<td>Rule making: employees use public forums instead of internal tools to ask questions and provide product-related answers</td>
<td>Direct engagement with customers and partners on media of their choice</td>
<td>Organisation recognises the value of engagement on alternative platforms and encourages it</td>
</tr>
</tbody>
</table>

Table 2 – Workarounds in organisations: reasons, aims, outcomes
The study shows that new technologies provide additional capabilities to circumvent established and prescribed procedures to achieve personal and organisational goals. The original model (cf Figure 1) thus can be extended to accommodate the agent’s ability to deviate from prescribed patterns (Figure 3).

![Figure 3 - Workarounds in the Sociomaterial Technology Model](image)

The reported intentions of workarounds are “positive” – the aims stated by the employees are aligned with reported organisational objectives of better knowledge sharing, employee attraction and selection. The workarounds take on different forms of deviations. In the case of UKBank, the workarounds are *rule breaking*: employees consciously circumvent the barriers placed by IT and use personal devices to access social media platforms to build relationships between recruiters and candidates. In UKConsulting the workarounds are *rule making*: the organisation recognises the shortcomings of existing policies and technologies and modifies existing rules to accommodate and legitimise workarounds. In UKOutsourcing the workarounds are in parts accepted and tolerated, with additional emphasis put on (re-)training the employees to discourage them from using workarounds. All organisations recognise that the causes of workarounds are legitimate and that workarounds are intended to eliminate the shortcomings of current processes. However, analysing the outcomes from the viewpoint of HR System strength defined by consistency, distinctiveness and consensus richness of HR-related communications, the consequences do not consistently align with organisational goals.

### 4.3.1 Consistency

In a strong HR Communication System, the consistency of the message is re-enforced over time and place. Employees in all three organisations use workarounds to be able to send out “personalised” messages. These personal statements may not be aligned with the organisationally desired content. E.g. recruiters in UKBank engage directly
with the potential candidates and “sell” their version of the vacancies to the candidates. Because this process happens “outside” of the prescribed systems and procedures, the organisation has no control or understanding of what is being communicated. Recruiters in UKOutsourcing use different tools to source the candidates. The processes and routines employed vary from recruiter to recruiter, as do the messages to the candidates. Due to the use of multiple disconnected systems, UKOutsourcing loses insight into how candidates are sourced and what is being communicated to them. Finally, UKConsulting is giving up control of the (proprietary) knowledge of its products and functionalities. Instead of keeping the Q&As in a manageable (and censorable) internal system, they allow potentially inconsistent messages to be sent from its employees, partners and customers.

4.3.2 Distinctiveness

From HR-management view, a distinctive message is one which comes from a “trusted” source. This could be a close relationship or a “trust-by-proxy”, e.g. high-level manager. Employees in all three organisations participate in exchanges on public social media, notably LinkedIn. The communications originating from personal accounts on LinkedIn are directed to candidates, colleagues, partners with whom the employees have a direct personal relationship (to a smaller or greater extent). The distinctiveness of a message, e.g. personalised job-advert, may increase through workarounds and the use of personal profiles and connections. One of the case organisations (UKConsulting) fully embraced the benefits of closer connections and incorporated communications on LinkedIn into their standard policy. UKBank partially accepted and recognised the benefits and changed some of its policies to accommodate a limited use of LinkedIn for recruiter-candidate communications. UKOutsourcing, on the other hand, is re-enforcing its policy of “using LinkedIn as prescribed” by providing additional training and insisting on extant rules.

4.3.3 Consensus

Consensus is a shared understanding between management and employees. From HR-prospective, consensus requires an ongoing validation of employee’s understanding of the management’s message (Bowen & Ostroff, 2004). The workarounds reported by the study participants create shorter feedback-loops on the one hand. On the other hand, due to a variety of available social media to “escape” from organisationally
controlled platforms, the organisations will struggle with gathering and analysing the feedback from a plethora of applications. It is unclear, in how far the organisations are utilising or can utilise the shorter feedback cycles from candidates to recruiters.

5 Conclusion

Social media offer novel ways for employees to introduce workarounds into their day-to-day IT interactions. Access to social media, contents on social media and visibility of social media content reside outside organisational control. The workarounds using social media pose new challenges to organisations’ use of IT and require new theoretical models to explain how these workarounds emerge and effect organisations, as well as practical recommendations for the organisations on how to assimilate workarounds into existing organisational routines.

Our study investigated how organisations use social media in the context of HR communications. The findings demonstrate that social media opens new possibilities for employees to deviate from prescribed policies and procedures. The findings are consistent with previous studies in that we are able to demonstrate that employees embrace new and alternative technologies when and if required to overcome shortcomings of existing IT (Morrison, 2015; Spierings et al., 2017). The application of alternative technologies to achieve organisational, professional and personal goals is defined as “workarounds” (Alter, 2014). Our findings extend the theory of workarounds by placing the focus on a radically new set of technologies – social media. These technologies are readily available and accessible by employees outside the control of organisations’ IT departments. The use of social media alters the established structurational model of technology (Orlikowski, 1992) and requires the extension of the mode through the introduction of workarounds. The properties of the HR communication process (Bowen & Ostroff, 2004) are affected by the workarounds by employees. While distinctiveness of the message improves and the workaround has reportedly positive effects, the consistency of and consensus on the message content may suffer and weaken the process.

The practical implication of our study is that organisations need to pay attention to emerging workarounds on social media. While these may offer some benefits, the loss of control and, ironically, transparency of the communications between employees
and external entities (e.g. candidates, partners, customers) may have a decremental effect on the strength of the HR communication process.

Our contribution to theory includes the extension of the structurational model of technology and accommodation of social media as an alternative path for human-technology interaction and the effects of these workarounds on organisational properties. Further, we validate findings from previous studies into the emergence and adoption of workarounds.

We demonstrate that employees are willing to break rules, change rules, work around the rules to achieve their goals. The employees report “good intentions” as a motivation for workarounds. These include stronger relationships with candidates, better knowledge sharing and improved candidate to job matching.

We further show that organisations react differently to workarounds. While UKConsulting is embracing the workarounds and incorporates them into the sanctioned processes, UKOutsourcing tries to discourage the workarounds by proving training and advertising benefits of the official procedures. UKBank is actively erecting barriers to workarounds on the one hand, and is softening some of its policies to accommodate partial workarounds (e.g. controlled LinkedIn use in the UK office) on the other hand. Our study did not cover the organisational motivations for adopting or resisting workarounds. This subject would provide a setting for another research project.

One of the observations of the reports was that all employees reported the desire to have a more “personal” connection to their counterparts as one of the reasons to deviate from official routines. Specifically, in the case of UK Outsourcing, while the organisation encourages recruiters to interact with candidates on LinkedIn, some recruiters do a “bare minimum” and prefer a personal phone call to the message exchange on LinkedIn. The value of social media use is reported not to be within “what” – creation, storage and retrieval of additional information. Other IT have been and continue to be successful in addressing this need. The value of social media use derives from “who” (do you know and connect to) – creation and maintenance of relationships. The value of personal connections as a motivational factor for workarounds, rule re-definition and rule breaking is a subject deserving closer attention in a different study.

The organisational routines are recognised as a source of continuous change and improvement (Feldman & Pentland, 2003). Our study captured a snapshot of
organisational reality. To understand how employees adopt the workarounds into their daily routines or how these are discarded after a short period, an additional longitudinal study would be required in the same or similar setting. A longitudinal study into workarounds would provide insights into the emergence, adoption and assimilation of workarounds in organisational practices.

Through workarounds and social media use, employees can create additional information flows and new dialogic relationships which were not possible without social media (Huang, et al., 2013). The decoupling of information creation and dissemination processes (Bowman & Ambrosini, 2003) paves ways of organisational knowledge management and learning. Two of the case organisations report ad-hoc solution-finding and knowledge-sharing on social media among and between otherwise dis-connected employees from different departments and continents. These organisations demonstrate cases of organisational learning and show how organisational routines are changing in response to workarounds.
References


DESIGNING FROM THE INSIDE OUT: A CASE STUDY OF THE DEVELOPMENT OF AN IOT APPLICATION

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Abstract
Far-reaching claims have been made about the potential for the Internet of Things (IOT) to impact a broad range of industries, from manufacturing to healthcare. However, research and development has tended to focus on what the technology can do and not what users want or need. Here we present a case study of the creation and on-going development of a commercially available IOT office solution where the developers and their organization are also users. The development team capitalized on this by bringing together the technology, user experience design and business perspectives in interactive sessions with potential external customers/users to improve the design solution. By actively listening to the potential users and then iteratively adjusting the product and testing continuously via their internal installation, they were able to create a successful commercial product. We believe that these findings can inspire a richer design and development process for future IOT solutions.

Keywords: user roles, user centred design, developers as users

1.0 Introduction
The Internet of Things (IOT), which refers to “objects that are readable, recognizable, locatable, addressable, and controllable via the Internet,” (National Intelligence Council, 2008) is often presented as one of the next paradigm-shifting technologies that will change the way we interact with the world and improve our lives in a variety of ways (Porter and Heppelmann, 2014). However, successful commercialization has not been widespread and IOT adoption has not yet lived up to the hype (Seungjun and Hyojung, 2016). IOT products have been criticized for lacking connection to real-world problems, a characteristic that can be attributed to having technological possibility rather than people’s needs as a starting point. Designing these systems of objects (sensors, devices, etc.), data, networks and people requires a different approach than those used for designing specific products or artefacts (Ghajargar et al., 2018). Developing an understanding of the target users, their needs, problems, wishes and contexts is therefore a crucial component for designing successful IOT products and services. Gaining successful user
involvement requires not only finding a means to include the appropriate users in design, but also providing users with the necessary space and tools to express their needs while also staying focused on the target problem within the context of the goals of the development organization. This can be challenging, especially in real-world IOT projects where, in many cases, technology is novel and therefore an unknown for the user.

As Markus and Mao (2004) have discussed, traditional IS theories of user participation were developed in a very different development landscape, and did not address trends in IS development such as package integration and outsourced development. In addition, traditional approaches to user participation did not adequately account for software developed for an external, global customer base or for iterative, on-going development processes in conjunction with the user. To better address these contexts, design theory and development practices have been shifting from passive user participation to active user involvement in iterative design and development processes.

In this case study we present a context with an evolving enactment of the user role wherein the application was initially developed by a software engineer as a side project simply to address a problem expressed by a fellow engineer (and also to allow testing of a new technology). Others in the organization saw value in the app and its use spread by word of mouth. Then, as the application morphed into a commercial product, the entire development team, which included not only the software engineer but also a UX designer and product manager with a sales and marketing focus, interacted together with potential corporate clients (customers/users). This joint approach to interacting with the user/customer to determine functional and interface requirements has not been addressed widely in IS or design research. Further, we found that there are several benefits to having members of the development team of an IOT technology be a part of the targeted user group. These were: a head-start on user involvement, a deep collaboration between stakeholders in the team, an ability to listen and understand user problems rather than focusing on selling solutions, and continuous iterative testing and development of the technical solution. These benefits can be used in other IOT development processes to enhance the design and development process with deep, rich, and meaningful user involvement.
In the next section we provide an overview of various stakeholder involvement approaches over time that have been described in the design and IS development literature, with a focus on the user and their interactions with the development team. This is followed by a description of the research method, the case study organization and the software development process that is the focus of this case study. The paper concludes with the findings from the case study and a discussion of how these can be relevant to other organizations.

2.0 Background

Historically our prescriptive development approaches have assumed that most software development is done by large organizations using an in-house development staff to create software that will be used internally. Through the 1980’s and into the 1990’s, systems were often developed and implemented on a very local basis, within one organization or even one department (Markus and Mao, 2004). But it is more likely today that a software development team is working on software that will be used by external users. Today, we see more focus on iterative development, where a software product is introduced with minimum functionality and then adapts over time in response to user experiences. With user-facing software, the design of the user experience has come to dominate pure functionality, making it even more important to truly understand the user perspective (Gkouskos, 2016).

The role of the user (or customer) in software development has been studied from many different perspectives, however we have not found any published work where the designers and developers were part of the user group during the conception of the technical solution. In this paper we highlight a context in which the users of a particular software application were originally the developer and his colleagues, but over time the application became a commercial product and “the user” label grew to include corporate clients and their employees. To understand how this differs from the role of the user and other stakeholders in the majority of popular information systems development methods, and why it is relevant, it is useful to examine established design and development approaches in terms of the roles of different stakeholders.
2.1 Roles of the User

We use the term “user” to refer to the individuals who are currently using the software or potentially could in the future, as well as those who make decisions about its purchase, such as a business leader acquiring the software for an organization’s employees (Eason, 2005).

Even early system development methods acknowledged that user involvement in software development was important, but early approaches to user involvement have been quite passive (Beath & Orlikowski, 1994). Traditional approaches typically follow a waterfall model that prescribes a series of sequential steps for software development, involving the user/customer in a limited “formal” way in only certain specific steps of the development process (Royce, 1970). Users are assumed to provide input (usually via interview or survey) into the analysis of the problem context and the identification of desired functionality, and possibly to perform some acceptance testing when the software is completed.

Agile development methods advocate increased user involvement in the process by having a user representative co-located as a member of the development team (Abrahamsson, 2002). Users, through their representative, are supposed to provide both requirements (through user stories) and test cases, and to be available to provide additional details to the development team when needed. Both Action Research (Avison et al., 1999) and Design Science (Hevner et al., 2004) research approaches could be considered as focusing on the user’s needs when defining the problem or issue to address with the system development process and when evaluating the results. However, the actual user involvement levels vary across projects, and the focus may be more on organizational goals than individual user needs and preferences.

When users are not readily available to be interviewed, surveyed, or to join the development team, fictitious users termed personas may be created to represent the user. One or more personas may be created to represent the user population, with the defining characteristics often based on research (Ma and LeRouge, 2007).

User centered design (UCD) can be considered a major shift in the design of interactive systems as it places the user at the center of the design process. In a UCD process users are involved as study subjects at the start of the design process and in usability evaluations of prototypes. UCD has been evolving through an increase in the importance placed on user involvement in the design process. UCD strives to
capture the users’ needs and engage users in the design process in an integral, iterative way (Abras et al., 2004). The way user-centeredness is implemented can vary from users as active participants to users represented by proxies such as UX designers, personas, representatives, or work roles (Iivari & Iivari, 2011).

With an increasing focus on user experience (UX), UCD processes have evolved into experience centered design. In such a design process the user’s experience is at the center of attention and factors such as context, emotion and time are significant in the shaping of the design artifact (Hassenzahl, 2010). In UX design processes, users are often involved through contextualized qualitative research such as interviewing, workshops and other ethnographically inspired methods (Roto et al., 2011; Gray, 2016).

Another strand of design is participatory design. In this type of design process the user is meant to actively participate in the making of the design artefact. In a participatory process the roles of users, designers and other stakeholders are blurred in order to redistribute power and responsibility among stakeholders and thus increase user involvement through participation (Kensing & Blomberg 1998; Sanders & Stappers, 2008). Participatory design approaches have recognized the importance of truly understanding the users and their context, which requires designers and developers to take a more ethnographic approach, in some cases working alongside the ultimate users of the system. This type of approach not only enables the designers and developers to gain empathy for the users, but it also enables the users to become much more active in the development process. This leads to situations where the users become co-developers, not only suggesting and requesting system features and evaluating prototypes, but potentially driving the process.

The tradition of participatory design has a lot to offer to the development of IOT technologies, especially concerning user involvement. Reddy and Linde (2016) argue that involving users as active participants in the prototyping of IOT solutions is crucial to developing an understanding that can enable building technology to address rich and diverse user needs.

There has been some relevant research work on how IOT technologies can be developed with user participation in different settings. One example is a study of IOT development in a participatory way by Fischer and Crabtree (2016), in order to provide energy consumption advice in a home setting. For this study, the authors
adopted a participatory design perspective where all of the stakeholders, including users, took part in the research activities, and the research took place in the homes of the users. Another study utilized the Do it Yourself approach to involve users in the making of IOT technology. In this study by Woo and Lim (2015) users themselves were given the opportunity to custom build IOT solutions and thus decide on the user experience that they would like to have within the limitations of the D.I.Y kits that were used. These examples illustrate the potential value of deeply involving users in the design of IOT technology, but that focus has not been well represented in IOT development literature.

While active user participation in the design and development process is important, other stakeholders have an impact on the development process as well.

2.2 Roles of the Technical Team

We will use the term “software engineer” to refer to those who are writing and deploying the code, and “UX designer” to refer to those who are designing and implementing the user interface. Other technical members of the development team could be project managers, platform developers, testers, or networking or data experts, for example.

One of the more prominent attributes of a successful UX designer is the ability to empathize with the user (or potential user) to facilitate understanding for the user’s circumstance, needs and wishes by bridging the gap between users and designers. The importance of empathy is highlighted in much of the design research published around user involvement in design (Chapman, 2012; Kouprie & Visser, 2009; Mattelmaki & Battarbee, 2002).

While it may seem more obvious that it is the role of the UX designer to facilitate the participation of the user, the developer or software engineer also plays a role “in creating …opportunities for users to participate” (Markus and Mao, 2004, p. 519). This participation is more important than its contribution to requirement elicitation. The development of relationships between the development team and the users contributes not only to a process that is more satisfying to both groups, but also results in socio-technical solutions that more fully meet the users’ needs (Markus and Mao, 2004).
The interactions between the technical team and the users varies across different types of projects with different levels of user participation (Keil and Carmel, 1995). At one extreme, it is possible for individuals to be both in the technology team (designers, software engineers) and in the target user group.

### 2.3 Roles of the Business Side, Particularly Sales and Marketing

Our investigation of the software design and development literature did not uncover any formal design or development approaches that describe a specific role for business functions such as sales and marketing, although these are routinely mentioned in new product development literature (e.g., Moenaert and Souder, 1990). Ebert and Brinkkemper (2014) do, however, adapt a product development model to software development, highlighting the importance of mapping requirements to value creation. They identify the role of “product manager” who manages the product throughout its life cycle “with the objective of generating the biggest possible value to the business” (p. 17)

The case study described below provided an opportunity to explore how these roles were enacted in the development process under study to address our broad research goal of understanding how this application was designed and developed, and what can we learn from it.

### 3.0 Method

The findings reported here are part of a larger case study of the development, deployment and impact of a commercial IOT office solution product.

Data for this portion of the study was collected via semi-structured interviews (Beyer & Holtzblatt, 1997) with participants in the design, development and deployment process. Two UX designers (identified as UX1 and UX2), one software engineer (SE), two high-level managers (identified as GM1 and GM2), and two facility managers (FM1 and FM2) were interviewed. The interviewees were selected due to their key roles in shaping both the IOT application and also in defining the inside-out approach that we describe here. An interview script was created for each type of interviewee. (Available from the authors upon request.) Interviews lasted between 45 and 60 minutes. In addition, the researchers participated in several meetings to discuss the software and to understand the broader organizational environment. The
researchers also spent some time at the research site as “pseudo-employees” so that they could have personal experience using the software. The transcribed interview data was analysed using qualitative semantic analysis (Miles & Huberman, 2014) where the researchers labelled and categorized snippets of the transcribed interview data into categories of similar meaning in an iterative way. Researchers identified relevant themes from the transcripts, discussed in the findings section.

The final phase of the study will collect data from end-users (both current users and potential users) of the application to explore how the application is used (which features and how frequently), the benefits the users derive from the application, reasons for not using the application, desired additional features, as well as individual, task and workstyle characteristics.

4.0 Case Study
This case study of the evolution of a software application from an in-house side project to a commercial product highlights the characteristics of the development context that we believe contributed to the success of the product. Key findings identify activities and processes that can be adapted by other organizations to suit their own specific contexts.

The case study site was the European division of a multi-national corporation which we will refer to here as EMNC. This division has primarily developed hardware and software, including consumer applications. The software that is the focus of our study is an IOT-based office solution/application that uses indoor positioning through hardware sensors to enable users to avoid time-wasting searching for meeting rooms and locating colleagues. The software allows users to view a facility map, their own location, and the location of workspaces on smartphones as a downloadable app and on large monitors located throughout the facility. Via the smartphone app, users can also search for co-workers and available meeting rooms, which is particularly important in open plan activity-based workplaces. The smartphone app notifies users when it is time to leave for a meeting in the facility and allows booking of rooms. In addition, sensors provide data on space utilization. The product is enriched with additional features on an ongoing basis.
The IOT solution was initially developed in 2009-2010 as a personal project by a software engineer to solve a very local problem: it was difficult and time consuming to locate meeting rooms in their buildings, and by creating the meeting room locating app the software engineer could both solve this problem and test the effectiveness of indoor positioning technologies under development.

“One of the main reasons to work on this platform was to evaluate different indoors positioning technologies. It started as an experiment. We did it on 10% time. It was a pet project, not official work.” - SE

Use of the IOT solution spread gradually by word-of-mouth through the host organization. Initially the only way to get the application was to obtain a copy from the developers but eventually the application was made available on to all EMNC employees via an online application store.

In 2015, changes in the competitive environment drove the organization to change its business model from being primarily a hardware vendor with software and applications supporting that hardware to a focus on new applications and related products. The organization began actively seeking innovations that would both effectively utilize in-house skills and achieve commercial success.

Whereas the typical approach to this type of drive for innovation is to look outside the organization for problems that need to be solved, in this case the problem and solution were identified internally. The “a-ha moment” was to recognize that this local problem was one also faced by other organizations.

“We got a lot of feedback from others. People that left [the company] and went elsewhere came back to us and said they needed this technology for their offices too.” – SE

However, there were hurdles to overcome. The application had been developed by software engineers for their own use and while it was functional, it didn’t have an attractive appearance nor was it easy to use. User experience (UX) designers were brought in to create a better interface. Expertise was also needed to identify the external market and to transition this software from a tool to a product. A manager with sales and marketing skills joined the team as a product manager.

Meetings were held with facilities management at several large companies both to understand the contexts of those organizations and to determine what features of the office solutions application could provide value to those organizations. The meetings were attended by the product team consisting of the product manager, a
UX designer, and a software engineer. From these meetings the team identified a core set of functions that would address the problems that were common across the organizations.

To prepare the first iteration of the office solutions application for commercialization, some functionality was removed because it was too localized to EMNC’s environment, too difficult to implement in other contexts, or not identified as useful by the potential customers. The user interface was modified and processes and tools were created to facilitate the installation of the product. As each change was made to the application, it was reflected in the application used by EMNC employees and thus tested in a live installation. A pilot installation at two customer sites was initiated in 2016. The application entered the commercial market in 2017 and sales have been steady. The product team continues to meet with existing and potential customers to identify new features to add.

5.0 Findings

Based on our analysis of the design and development process, we have grouped the relevant findings in four themes that highlight the particular aspects of the approach that contributed to its success.

5.1 A Head-Start on User Involvement: Designing from the Inside

Coming up with an idea to solve one’s own problem can have some clear benefits. The initial team has been quite invested in the idea that they had, and clearly understand the context from a user perspective. Rather than conducting ethnographic research with potential users, the initial developers engaged in “auto-ethnography” by being users of the application they were creating. One of the difficulties in early design and development processes can be having access to the user group. In the case where designers are part of the user group this issue is resolved.

The challenge when working from this internally-initiated perspective is to broaden the understanding of the problem by including experiences and perspectives of other potential users. As the design team in our case study grew and progressed,
new perspectives were added to the mix, both from internal company employees but also from external users. This enabled the developers to realize that different users appreciated different aspects of the product. One example is the use of bubbles containing the user’s photo and name which display on the local large monitor (TV screen) when the user approaches a that monitor.

“We get feedback that people like the TV screen bubbles popping up. I don’t see the value in that. We had a lot of positive feedback on the bubbles that they make something dynamic and personalized and that is valued by the customers” – SE

5.2 Co-developing: Users + Technology, Design and Business Perspectives
One of the effects of having a small development team where developers belong to the user group was that the design, the business idea and the necessary technology were developed simultaneously. This type of work allowed the team greater flexibility as they could quickly adapt different parts of the product package based on business, technology and design needs. Having a close collaboration between product team members and including the software engineer, the UX designer and the product manager in meetings with potential customer organizations provided significant benefits. As one UX designer stated:

[This was] “more than a user-centered approach. From a designer’s perspective this is the best data I’ve ever had [because] I got the business version of it too, I knew why they want to pay us money for it.” - UX1

As it turned out, having a multi-disciplinary team partake in client meetings led to better deciphering of the client’s needs by using each stakeholder's own expertise; a technology expert could easily see opportunities to use technology to satisfy the clients’ needs, a designer could readily identify UX needs, and the business expert could ensure the product is viable in the market. The business leadership also recognized the value in this approach.

“Engineers they do stuff because they can, they do things that are brilliant from an engineering perspective, but they don’t think ahead. Who is going to buy it, how can we price it? That is the part we need to add to the equation now. A combination of these competencies will be the key to success.” - GM1

5.3 Listening to Problems Rather than Selling Pre-made Solutions
Another characteristic present in this case study was that meetings with prospective clients were more focused on listening to the client and adapting the solution based on expressed needs rather than on selling the product to the client. This practice provided valuable feedback to the product team to enable them to improve the design and functionality of the product based on client’s expressed needs. The fact that the product team themselves belong to the user group enables greater empathy and a deeper understanding of end users and clients.

“We quickly had interested customers and a prioritisation of what the important problems were. We saw the same issues come up in these companies.” - UX1

As the business leaders pointed out, this was EMNC’s first experience selling in the business-to-business (B2B) space rather than business-to-consumer (B2C), and “selling IOT [such as this product] is different.” (GM2) The process of listening to the problems of other organizations both created relationships with potential customers and allowed a more streamlined development process because time was not wasted on features that were not relevant.

5.4 Continuous Testing: The Lived Experience

Since EMNC employees had been using the software through various iterations since 2010, the product was in effect being continuously tested. The lived experience of the product gave valuable insights that simply would not have been possible by testing done externally.

“[The application] was developed from [engineers] but they developed it for themselves as users. They used our facilities as a test bench, and we facility managers we support that.” – FM2

Even after the commercialization of the product, new designs, new sensors, and new features were tested at EMNC before rolling them out to customers.

“We still have [the developing organization] as a test house and then we can do what we want. If I were a customer it would be valuable to me to know that the company that makes the product use it themselves” - SE

A challenge was to ensure that internal testing was done not just by the developers but also by users not involved in the project.

“How do you get people using it for the first time so they get hooked on it? One of the key challenges: how do you get people to actually test things?
There are always people who are really into technology - they will test everything. But then the challenge is when you scale it, how do you do that, how do you get people to like it?” - GM1

In addition, the development team worked closely with the pilot companies, gathering feedback at multiple points in time.

“Pilot companies would pay in interview hours, so we interviewed before installation, after one month of use and then later on. And we had the statistics as well” – UX1

6.0 Discussion and Conclusions

In the case study presented here, the product development team members were also users of the product. We found that the dual roles of the product team resulted in some clear benefits that could be seen in the design and development process. While the engineers’ technical and local knowledge were essential for the initial creation of the application, feedback from other users was necessary to create a better product. Early and on-going user involvement, an openness to users and their needs, and a synergistic collaboration between business, technology and design ultimately produced a commercially successful product.

The fact that the initial version of the product was created internally was beneficial because both a deep understanding of the problem and the technical knowledge to solve it existed in-house. This type of “sticky” knowledge, as Von Hippel (1994) calls it, can be expensive and difficult to acquire if not available in the organization. However, whenever a developer is creating an application from first-hand experience there is the risk that the developer’s experience may be significantly different from that of a typical user. Here the interdisciplinary nature of the product team along with early involvement of other users both at EMNC and the pilot companies in the design process allowed for developing a broader understanding of the problems faced by a variety of organizations and individuals.

The creation of a cross-functional team bridging both technology (UX design and software engineering) and business sales and marketing knowledge was important in this case. This is consistent with new product development studies that indicate that cross-functional teams are critical (e.g., Ernst et al., 2010).
The problem-solving approach taken by this team when meeting with potential customers also contributed to success. This is consistent with what Markus and Mao (2004) found, “When change agents use a “facilitation” approach rather than a “technical expert” approach to participation, participation in solution development is more likely to contribute positively to both system quality and solution implementation”.

Often in development projects limited attention is given to how the system or software is integrated into the actual work environment and how feedback from its use can influence on-going design efforts (Hartswood et al., 2000; Berg, 1999). However, in this case feedback was obtained throughout the product lifecycle both inside the development organization and from external users. This lived experience of using the application provided valuable feedback that was used to improve the product.

While not every software development organization will be able to identify a home-grown application that can become a commercial product, most should be able to apply some of the other approaches used by EMNC. While these insights are not necessarily unique to IOT, they are particularly relevant in environments where technology is new or rapidly evolving, which makes it more difficult to determine up front how the technology can meet the needs of users.

There are some additional limitations that should be taken into account. This study was conducted in only one organization and regarding the development process for one IOT-based product. No end users in client companies were included in this part of the study, and the product has not been in the market for an extended period of time.

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References


Dynamic pricing and benchmarking in AirBnB

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Abstract
Since Airbnb opened in 2008, renting private accommodation has evolved into a strong market presence worldwide. Recent research has focused on whether this new supply will negatively affect hotel performance. Studies mainly focus on market performance and professionalization, but there is an absence of research regarding available knowledge and experience of pricing considerations. This research focuses on pricing decisions for individual apartment rental, examining the relationship between Airbnb pricing and knowledge transfer from related fields, such as hotel revenue management, benchmarking and online travel agencies. The primary research was conducted through semi-structured interviews with industry professionals, complemented by data examples that show the relevance of individual pricing. Findings confirm that applied revenue management and benchmarking concepts can enhance a host’s booking performances. Motivation and pricing experience amongst professional/non-professional hosts differ. Benchmarking professionals identify that market research becomes a key activity for running a successful business.

Keywords: Dynamic pricing, Gig-economy, AirBnB, sharing economy

1.0 Introduction
Despite the hotel industry being the largest provider of accommodation supply, disruptive players have entered the industry and forced providers to adapt within this fast-changing environment. The sharing economy has become a new trend. Their largest industry provider - Airbnb - has been growing significantly, since it was founded in 2008. According to STR (2016), Airbnb listed 3 million accommodations globally in November 2016. This scale illustrates how impactful Airbnb has become in a short time and continues with strong supply growth. Consequently, Airbnb is perceived as a disruptor to the traditional hotel industry (Guttentag, 2017).
Airbnb has emerged as a powerful platform, with almost three times more supply listings than the largest global hotel chain, Marriott International (Haywood, 2017). Rapid growth and development in the sharing economy have highlighted the need for training and learning between the established hotel industry and the sharing economy, in particular Airbnb (Li et al., 2015). The objectives of this research are to determine to what extent dynamic pricing strategies and benchmarking practices are applied in the sharing economy of accommodation and whether benchmarking and dynamic pricing concepts can be applied to Airbnb.

The most recent trend in the hospitality industry is the change in customer needs in relation to the sharing economy and consumerisation of supply, extending accommodation into personal homes (Staff, 2017). Compared to the hotel industry, Airbnb has emerged as one of the most powerful platforms for private accommodation supply (Haywood, 2017), a trend that expanded very quickly since Airbnb was founded. The past decade has not only seen rapid supply development in this segment of the sharing economy, but also renting private accommodation has become more commercialised.

Surprisingly, the effects of pricing in AirBnB have not been closely examined, especially the concept of 'Dynamic Pricing'. Dynamic Pricing methods aim to optimise pricing in response to supply and market demand changes. Dynamic pricing is also referred to as Revenue Management (hotel industry) (Zheng & Forgacs 2017) or Yield Management (airline industry) (Smith, Leimkuhler & Darrow 1992). In its current context, it refers to the adaptability of price according to fluctuating variables: selling the right product, to the right customer, at the right time, for the right price and through the right distribution channel. American Airlines was first to introduce the concept of Yield Management in 1987; after which it was quickly adopted and developed further by other industries, such as the hotel industry, and most recently, influences are applied in the sharing economy of the hospitality industry. The hotel industry benefits from years of experience, data resources and sophisticated revenue management systems applied by trained revenue managers. Airbnb, on the other hand, is operated mainly by private hosts.
This study obtains qualitative data to address knowledge gaps of pricing implications for Airbnb hosts and to understand possible benefits from key revenue management principles and industry benchmarking. The discussion with industry experts shares individual findings and common themes of strategic pricing that apply to Airbnb operations, such as rate restrictions, market research and monitoring of performance data. This research contributes to better understanding of pricing strategies used by industry experts, demonstrating relevance of benchmarking and success of revenue management concepts, and by AirBnb hosts.

### 1.1 Main Research Question

To what extent are dynamic pricing strategies and benchmarking practices applied in the sharing economy of accommodation; are concepts of dynamic pricing and benchmarking transferable?

### 2.0 Hotel & Airbnb market comparisons and pricing considerations

Airbnb is one of most recent trends in the hospitality industry (Haywood, 2017). There has been little quantitative analysis of this topic; the STR report is one of few that analyses data provided by Airbnb directly. In this study, Haywood (2017) suggests that Airbnb supply listings outnumbered the largest hotel chain – Marriott International - by almost three units to one in 2017.

Haywood (2017) finds that despite the recent increase of Airbnb supply, hotels in the U.S. have seen consistent revenue-per-available-room (RevPAR) growth for 77 consecutive months with 117 million room nights sold. Haywood (2017) confirms that demand patterns are highly dependent on market dynamics. Airbnb generally showed highest performance in markets with high hotel occupancies. As a result, the occupancy for Airbnb was significantly lower than for hotels in 2017. Consequently, the demand for Airbnb compared to its supply is still relatively low.

A number of studies have attempted to evaluate the impact of Airbnb for hotel occupancies and pricing. Zervas and Proserpio (2017) find Airbnb has a measurable impact on hotel revenues, serving as a substitute for hotel stays during specific
demand periods. The impact, however, depends on the region, market segment and seasonal cycles. Hoteliers either perceive peer-to-peer platforms such as Airbnb serve a niche market, or fulfil complementary segments of hotel demand.

Zervas and Proserpio (2017) indicate that significant seasonal fluctuations in Airbnb supply correlate with hotel demand during peak demand periods. The fluctuation of supply, in combination with special events, limits hotel pricing power. However, Zervas and Proserpio (2017) conclude that the sharing economy is significantly changing consumption patterns, and in the example of Airbnb, results in a negative impact on hotel revenues.

Similar to Zervas and Proserpio (2017), Hooijer (2017) analysed the largest Airbnb sample markets in South Korea but found no impact on hotel revenue.

### 2.1 Airbnb and disruptive innovation

In contrast to Hooijer (2017), Guttentag (2017) found performance shifts within the industry when analysing specific hotel classifications compared to Airbnb, describing Airbnb as “disruptive innovation”, where 4- and 5-star hotels are priced much higher than entire homes or apartments in Airbnb. The results suggest that private Airbnb rooms are more comparable to 1- or 2-star hotel classification in the lowest price brackets.

Guttentag (2017) concludes that Internet technology, cost savings, household amenities and local experiences provide new attributes, which have the potential to disrupt the traditional accommodation sector. According to Zervas and Proserpio (2017), 10% growth in Airbnb supply listings, results in 0.35% decrease in monthly hotel room revenue.

Further supporting the disruptor label, Henten and Windekiilde (2016) examine transaction costs for the particular examples of Uber and Airbnb in regard to firm growth objectives and suggest the “old models” (hotel and taxi) will suffer from new business models in the foreseeable future, but they will not be “entirely eradicated”. The sharing economy has become more commercial, shifting from non-profit sharing to for-profit sharing over time.
Oskam and Boswijk (2017) describe Airbnb as a challenging innovation, which will require a response from the traditional hotel industry, especially in booming destinations, the risk for commercialization is high and counters the benefits of innovation. They argue that the sharing economy has to be understood as a “market transaction”. As a result, they see business and leisure travel becoming more and more a blurred segment. Airbnb has been increasing its focus on the business segment by using strategic partnerships, such as Concur, to widen their reach into the hotel market share (Weed, 2015).

The existing literature shows that pricing is a major focus for Airbnb and it is subject to comparison with hotels in the hospitality industry (Weed, 2015; Oskam and Boswijk, 2017; Zervas and Proserpio, 2017). However, further research is required to analyse the impact of how pricing is considered by Airbnb and its impact on hotel performance. Hotel revenue management and benchmarking in relevance to Airbnb Rohani (2012) defines dynamic pricing as 'making price changes in response to market demand'. He suggests that dynamic pricing not only offers higher price ranges, but sets rates flexibly according to demand and take more pricing influence when market supply is limited. Linking this to the performance impact of Airbnb, dynamic pricing does not only apply to a change in demand, but also to changes in fluctuating supply. Other authors confirm the importance of market fluctuations. Cleophas (2016) describes revenue management as the prime example of planning under uncertainty. Revenue management relies on forecasting future demand as well as making the right assumptions for setting appropriate parameters as part of strategic planning. Cleophas (2016) elaborates that most revenue management models consider a fixed capacity and therefore do not factor capacity changes into their model. Therefore, efficient revenue management aims to absorb the impact of uncertainty to find flexible, as well as stable, solutions. Kimes (2010) analysed survey data from over 500 hotel revenue management professionals to find common strategic directions for the future and identified ‘analytical skills’ to be the most important characteristic of future revenue management professionals. As this study focused on professional revenue managers, it raises the question of whether analytical knowledge is equally available and applied in the sharing economy. Hwang and Lockwood (2006, p.338) find small and medium
size enterprises (SME) in the hospitality industry have higher knowledge barriers and fewer resources, often resulting in “poor strategic planning”. Hwang and Lockwood (2006) suggest this is a fundamental issue for SMEs, as the hospitality industry is subject to sudden and unforeseen changes in demand.

Yeoman and McMahon-Beattie (2017) describe revenue management as more than just operational research and algorithms, but as a holistic approach encompassing consumer behaviour. Therefore, it is not only the ability to sell the right product or service to the right client, at the right time and for the right price, but more importantly to understand consumer behaviour. This is essential for making the right pricing implementations and developing a pricing strategy.

Taken together, these studies support the notion that revenue management relates to benchmarking and market knowledge. Trento et al. (2016) explain that setting the right pricing strategy requires identifying the value proposition and pricing expectations of the customer first. Demand-based pricing and customer willingness to accept a price requires benchmarking on several levels: price value for the customer, customer expectations associated with each value, price alternatives and substitutes.

2.2 Technological enhancements in the hospitality industry

Revenue management and benchmarking are crucial to understand consumer demand, uncertainties and demand fluctuations. The airline and hotel industries have developed technological advancements, big data processing and mathematical algorithms for better pricing decisions (Yeoman and McMahon-Beattie, 2017). These concepts have been mimicked by secondary industries; Airbnb has recently rolled out their own rate recommendation tool.

Lee (2015) describes Airbnb's price recommendation tool as a machine-learning tool that suggests pricing according to location, travel trends and listings. That Airbnb developed an independent machine-learning system shows on one hand the complexity around benchmarking and dynamic pricing of this industry, and on the other hand tries to simplify the effort of research to a level of convenience for the end users. Lee (2015) states the tool's main function is to adjust a host's listing price for a higher likelihood of securing a reservation. The evidence reviewed here seems to
suggest revenue management is mainly applied for higher occupancy rather than better pricing independence for higher yields. Airbnb itself confirms this argument in its own blog (Blog.atairbnb.com, 2017): "When you see a tip, the model gives you insight on whether you could earn more money while maintaining your likelihood of getting booked, or you could increase your likelihood of getting booked by lowering your price". It is possible that Airbnb has a stronger interest in higher occupancy levels over the actual total price achieved. Higher market occupancies seem to benefit Airbnb.

2.3 Rate determinants and influences on Airbnb
Denning (2014) investigates the main factors that determine price setting in the sharing economy suggesting that user values have to be understood first. Hotel users “not looking for friendships” are unlikely to stay with Airbnb and are less price-sensitive. Furthermore, the costs and service level for a hotel stay are significantly higher than Airbnb. Despite the higher cost of accommodation for hotels, the reliability, brand reputation and service standards remain a more important factor than price alone.

The effect of discounting results in benefits for the user and generally higher ratings for the host. Rohani (2012) found dynamic pricing resulted in higher response rates than uniform pricing. This shows that dynamic pricing can be used in customer engagement and lead to higher values. Choi and Mattila (2009) confirm that consumers are aware of price differences and seem to accept the application of dynamic pricing, as it gives the consumers a choice over the price. To illustrate the result, consumers may receive a lower rate for accepting early bookings or minimum day restrictions for a reservation.

2.4 The influence of ratings to performance
A considerable body of literature has developed around the theme of pricing in regard to ratings. Teubner, Hawlitschek and Dann (2017) find revenue generation depends on how much demand a particular host is able to attract at a specific price. The reputation of a host is therefore instrumental for converting booking requests into actual reservations. Capitalizing on high reputation opens more opportunities when selecting guests and raises their willingness to pay higher rates. These results suggest that
Airbnb ‘Superhosts’ can leverage higher rates without losing significant demand, compared to hosts without such a title.

This finding is contrary to Neumann and Gut (2017), who find that online ratings tend to be inflated and are therefore not a reliable indicator of quality. They also find high rates can result in negative ratings, which may bring down future rates and suggest that building a good online rating in the beginning can result in raising prices.

Concerns have been expressed about general knowledge gaps for price setting by Airbnb hosts. Li et al. (2015), find a knowledge gap between individual non-professional Airbnb hosts’ and professional revenue managers results in substantial differences in operational and financial performance. Supply managed by professionals achieved on average a 16.9% higher daily revenue and 15.5% higher occupancy rate. In addition to the performance results, professionally managed supply is also 13.6% less likely to exit the market (Li et al. 2015): Demand is less effectively managed by non-professionals, for example during conventions, festive seasons or holiday periods; non-professional hosts perform only minimal pricing adjustments. In contrast to the hotel industry, available supply is continuously adjusted depending on the booking horizon, days left and changes in demand pick up. Li et al. (2015) conclude that it takes ownership and control in order to operate apartments efficiently. Supply and distribution management is a key task for revenue managers, certain concepts can be applied to Airbnb.

2.5 Single supply distribution and application of outsourced services
Revenue management decisions generally calculate the cost of distribution into their demand forecasts and therefore still aim for profit optimization. Distribution channels vary in cost and attract differently customers, which has to be considered as customers differ in their price-sensitivity and loyalty and flexible management of distribution channels help to direct business to those channels that are most profitable (McGuire 2009). The key for profit optimization can be achieved through integrated pricing, marketing and distribution strategy. Revenue forecasting, followed by promotion strategies through marketing and customer-centric pricing will result in willingness to pay the cost of rental and increase overall demand levels (McGuire 2009). Airbnb
hosts have fewer available options to fine-tune their distribution strategy, as they rely on the integrated marketing and distribution of Airbnb.

Cost management of an Airbnb booking benefits the hosts more than the guests, due to the booking payment contributions to Airbnb (Zervas and Proserpio 2017). While hosts are generally charged only 3% cost of processing payments, guests are charged a much higher mark-up, up to 12%, when completing the booking. Online travel agency commissions are generally applied to the total room rate, which directly affects hotels’ profit margin.

The knowledge gap for pricing around Airbnb has created new businesses that commercially provide pricing recommendations and distribution of Airbnb supply, e.g. Airsorted, Hostmaker, Pass the Keys etc., opening opportunities for Airbnb hosts with less pricing experience than professional revenue managers (Loescher 2017). Hosts have neither revenue management teams on staff nor extensive data sources available to support precise forecasting and pricing decisions, thus services provided by outside companies can help hosts with pricing decisions. These services benchmark to other vacation rental sites and analyse the wider impacts of dependencies, such as seasonality, airline arrivals, weekday/weekend patterns and the impact of events. However, Loescher (2017) points out that these services have their price added to every booking, thus increasing the overall costs, decreasing profit margins. As a possible solution, Loescher (2017) suggests that hosts can remove their listing when demand is low and apply high rates when demand is identified as strong and inelastic.

3.0 Data Collection Methodology and Limitations

This research is conducted as an exploratory study using primary qualitative data from semi-structured interviews. In addition, the discussion is supported with data examples taken from a rate scraping exercise and hotel performance data. The research combines discussion themes with data examples and visualizations, to underline the relevance of the arguments and relate the findings back to the main research question and literature review.
3.1 Qualitative Research

Qualitative data for this research was collected through interviews within a specific target population and industry segment - non-probability purposive sampling. The purpose of conducting interviews is to gain a higher understanding of the transferability of specialized knowledge from the hospitality industry to Airbnb.

Issues, such as price discrimination, restrictions, booking patterns or seasonality have been addressed in the interviews. As part of the rate scraping exercise, the examples are used to showcase specific interview answers and their application within the scraped data set.

In order to gain more understanding of the decision-making behind pricing, primary data has been collected through semi-structured interviews with sixteen industry professionals from four main knowledge groups: revenue-management, benchmarking, online travel agencies (OTA) and Airbnb hosts. The four groups are most relevant to evaluate pricing considerations and benchmarking within the hotel industry. Common themes for the interviews were chosen according to the expected expertise the individual groups bring to the discussion. The interview outlines were semi-structured, in order to allow respondents to provide detailed answers within their field.

Most interviewees have requested their answers to be treated anonymously; certain questions could therefore not be specified in the interviews.

3.2 Interview Outlines

- Central to the discipline of pricing are the themes around experience, training, market knowledge, independence of decision making, forecasting, setting of restrictions and the reasons for renting properties. An outline of these themes according to the target groups is provided below and will be elaborated in the discussion section.
- The interviews were conducted over the phone, on Skype or in person. All interviews were recorded after approval was provided prior to the first question.
- The recordings of all interviews were transcribed. Due to confidentiality, the interviewee names are replaced by a category and an abbreviation.
- Depending on the details provided, the interview times ranged between 8 – 20 minutes.
3.3 Interview Target Groups and Key Themes

Perspective 1: Airbnb Hosts
- Evaluation of the base price
- Learning from experience and adapting to price changes
- Pricing considerations and dynamic pricing
- Use of third-party service providers

Perspective 2: Revenue Managers
- Advantages of revenue management in the hotel industry
- Application of revenue management in the sharing economy of accommodation
- Evaluation of revenue management concepts applied for Airbnb
- Further pricing strategies, analysis tools and analytical concepts

Perspective 3: Benchmarking Experts
- Comparability of supply between hotels and Airbnb
- Disruption of Airbnb on the current hotel industry
- Use and benefits of performance benchmarking
- Pricing strategies for Airbnb through benchmarking knowledge

Perspective 4: Online Travel Agency Experts
- Influence of OTAs on Airbnb
- Benefits of OTAs and use of multiple distribution channels
- Knowledge transfer from OTAs into Airbnb

The quantitative research is limited to certain specific examples of availability and pricing between Airbnb and hotel performance, for example by comparing availability and pricing of selected Airbnb properties during an event period against hotel occupancy and average daily rate performance during that same period. As part of the quantitative analysis, a total of 3036 hotel and Airbnb data points were collected.

All data visualisations were built in Tableau Desktop, version 10.2. The Airbnb apartments used in the rate scraping exercise are not related to those of the interviewees that participated in this research but merely used as illustration.

3.4 Sampling
As part of the Airbnb rate and demand analysis, a convenient sample of 15 properties is analysed in three locations in London. A manual approach for rate scraping was used by visiting the sample properties on the public Airbnb website (Airbnb.com) manually recording their performances and changes. For a month and a half, starting
in April 2017, each property was recorded (rate scraping) in terms of availability, published rate for current day and same day the following month (day-to-day comparison). The data was collected in Microsoft Excel tables and further analysed in Tableau Desktop.

Additional information recorded from the website were the “limited availability” notifications when available market supply dropped below 30 listings. This exercise allowed for the analysing of current day rates, occupancy and market availabilities for the three event locations in London.

The scraped data was compared to STR Trend Reports, analysing the same location criteria and comparable sample within the economy and midscale market segment. The subject listings and hotels are within 1.5km proximity to the event venue. Hotels were selected as a convenient sample within the specific market class. Airbnb supply was selected based on listings showing up first through the location search on the Airbnb website. For the purpose of this analysis and better comparability, Airbnb rates were indexed to their average advertised rates in order to get a clearer understanding of rate changes. The rate for Airbnb apartments ranges from 30 GBP to approximately 200 GBP. The analysis therefore used indexed performance in order to test the elasticity of the rates that fluctuate by the day. Due to the limited sample in this exercise, Airbnb market averages are less representative within the total available supply. Indexes therefore allow a more representative perspective on performance changes.

In order to guarantee that no individual hotel performance can be isolated, STR statistics have to follow strict reporting guidelines. All guidelines around sufficiency and isolation have been fulfilled for all ad-hoc Trend Reports used for this research. The data therefore does not reveal individual hotel performance. An STR ad-hoc set has to include a minimum of 5 properties. In addition, the room count share must not exceed 50% (Property) /50% (Affiliation) /75% (Parent Company) /75% (Owner Company) /75% (Management Company) of the total room count share.

3.5 Sample Locations
The following locations have been chosen as case studies for analysis. The selected locations show generally high demand dependencies and event details are publicly available.

O2 Arena: The O2 Arena is located on the Greenwich Peninsula in East London. The arena functions as an exhibition space and event venue with a capacity up to 20,000 spectators.

Wembley Stadium: Wembley Stadium is located in northwest London, Borough of Brent. It is the largest sports venue in London. Besides major sport events, the stadium hosts large concerts.

ExCeL London: Exhibitions and international convention centre. London, Borough of Newham. The convention centre is located in close proximity to the banking district Canary Warf and London City Airport.

4.0 Data analysis

Pricing determinations are dependent on many different factors, such as market supply changes (Zervals and Proserpio, 2017), customer price perception (Trento et al., 2016) or ratings (Teubner et al., 2017). Li et al. (2017) identify a knowledge gap between individual non-professional Airbnb hosts and professional revenue managers, which results in differences in operational and financial performance. The following section investigates four perspectives on pricing experience and knowledge spillover into Airbnb. The aim of the semi-structured interviews with industry professionals and hosts is to gain better understanding of pricing, benchmarking and distribution concepts in Airbnb.

4.1 Perspective 1: Airbnb Hosts

Evaluating the base price of an apartment with motivation for a cash bonus

The participants, on the whole, demonstrated that Airbnb is not perceived as a 365-day business, unlike hotel room rentals. The interviewees illustrated their personal motivation towards the work and time they put into apartment rental, which differs from host to host. ABBH1 has no concern about "not having full occupancy", as long
as the price achieved is high on the anticipated days of rental. Using Airbnb as a "bonus" or extra cash, instead of a "necessity of cash flow" can therefore be riskier for securing a reservation, when prices are set too high.

The aim of ABBH2 is to rent out on particular days and is therefore willing to accept bookings at lower rates, as long as they fill the anticipated day requirements. ABBH2 perceives Airbnb's price recommendations and push-notifications as helpful to fill supply, especially ahead of time. "I find that what Airbnb is recommending is good, it's correct." This price setting is motivated by filling occupancy on desired dates rather than achieving high rates, or in the worst-case scenario losing an opportunity if the desired booking window cannot be filled.

When asked about the initial price setting of the listing, ABBH3 described her knowledge as "in all honesty, my dad told me the price." Her apartment rental is seasonal and rates seem to follow a regular pattern; she describes "my rates are different in winter to what they are in summer". The price setting in seasonal markets implies certain price expectations as to what can be achieved and how many days can be used as a bonus income for the duration of a season. The statement suggests that there are different levels of experience amongst hosts around simply renting their supply and aiming to maximise profits.

Commenting on initial price setting, ABBH4 stated, the "outgoing costs play part of how much I would charge to rent the room". In addition to the fixed costs it seems to be important "looking what others charge and the alternatives to Airbnb, which could be hotels, hostels and other accommodation".

**Data example*: Use of hotel benchmarks to understand market impacts**

*The data by STR shows the average hotel occupancy and ADR for an economy & midscale ad-hoc set 1.5km diameter around the O2 Arena. The performance shows how hotels achieve above-average occupancy rates for specific event periods. Airbnb hosts can use hotel performance data to benchmark their demand patterns and significance for events impacting Airbnb demand. Events such as WWE (92.4% OCC) or the Iron Maiden concert (96.5% OCC) illustrate how performance is increasing and impacting both occupancy and rate.*
4.2 Learning from lost opportunities and playing with data

The majority of interviewees reported that initial market research is common practice for price setting and testing, after signing up as a host. ABBH3 and ABBH4 operate in seasonal markets, which show high demand and increased rates during high season and low demand and competitive undercutting of prices during low season.

Most interviewees echoed a willingness "to play around" with the price in order to guarantee a reservation. ABBH1-3 consider price decreases in order to secure a booking. ABBH2 noticed that Airbnb users are often price-sensitive and that small price decreases can result in a reservation shortly after. Especially the target market of Airbnb is attracted by low rates; "Backpackers, young people, students, they even think of one Pound, and if the price is two Pounds less then they will book that."

An alternative pricing approach was suggested by ABBH1, setting the price very high towards a target date and then reducing the rate in small and consistent steps. This can result in high rates ahead of the booking, however it carries the risk of not selling out during a particular time.

There were concerns about the Airbnb pricing tool and rate recommendations. ABBH1 and ABBH4 have identified that Airbnb's price recommendations are set too low and are therefore not followed for achieving higher yields; "the Airbnb recommended price is so low that you are pretty much guaranteed to get somebody if you sell straight from that price" (ABBH1). Independence of decision-making
requires independent market knowledge, learning and adjustments from previous rentals.

ABBH4 answers the question on "how did missed opportunities influence your future pricing strategy?" by saying, "generally it is the case of under-pricing has resulted in learning and increasing the price for the same or similar events the following season or year".

4.3 Establishing market benchmarks and evaluating events
Apart from seasonality affecting demand changes, hosts are aware that events can impact the demand on their market. Events can result in a much shorter booking window and increase the price for the duration of an event. Even though this kind of information is publicly available, not all hosts seem to be aware of the events that impact their business most. ABBH3 answers, "I always find out from the travellers that the event is up. Like now the Adele concert, people are writing me because of the concert".

ABBH4 concluded: "the main lesson learned is to try and increase your knowledge of these events coming up in time to adjust your pricing". Awareness about events that do not follow the regular seasonal or weekly patterns can influence the revenue potential of an apartment.

4.4 Dynamic pricing and discounting considerations
Every Airbnb apartment requires a base price for weekdays and weekends. After initially setting this fixed rate the host decides whether to switch on dynamic price recommendations or keep the rates fixed throughout the calendar. All interviewees were using the dynamic price setting. Hosts generally experience the pricing tool as easy to understand and "play around with it and see what is working and what isn't" (ABBH3). Playing with the Airbnb internal data may help hosts to get more experience around their property and market performance, though "playing" with the data instead of being able to derive informed decisions from larger data sets and advanced systems may still result in lost opportunities for price setting or in responsiveness to market changes.
**Data example: Use of flexible rates when competing for demand**

The rate scraping data example visualises the index of two Airbnb participants compared to indexed hotel pricing in ExCel, London. While data participant Airbnb3 offers static rates (e.g. 8-13 April, 16-20 April) Airbnb4 lowers the advertised rates on several days where hotel occupancy falls below the average (11 & 12 April, 23-25 April). Lowering rates during lower demand periods aims to increase occupancy rates, often by undercutting direct competitors.

ABBH4 experienced that pricing does not only affect high demand periods, ABBH2 and ABBH3 decide to offer discounts if guests stay longer than their usual minimum nights.

All interviewees operate their apartment more as a hobby and opportunity for some “extra cash”, rather than running it as a professional business. This shows that Airbnb rental is triggered by different motivation for optimizing rates. None of the four hosts operates more than one listing on the Airbnb platform or advertise it through other platforms. The general consent about using third-party service providers or pricing agencies, such as Airsorted, Hostmaker or Pass The Key, were not perceived as necessary for their capacity.

**Data example: Static rates vs. dynamic pricing**
The graph visualises the rate performance advertised on individual Airbnb apartments compared to the daily hotel ADR. For the purpose of comparability, the rate performance is indexed to the average rate performance of the month April & May. The graph shows how hotel rates fluctuate between high and low performances while Airbnb supply shows more or less static rates, as advertised on the platform.

This supports the assumption that dynamic pricing techniques are not generally applied. Further research and larger sample is required to confirm a general trend.

Summary: Perspective 1 – Airbnb Hosts

- Airbnb is not perceived as a 365-day business for non-professional hosts. Therefore, motivation and pricing experience amongst professional/non-professional hosts differ strongly. Dates often more important than maximising revenue.
- Price setting is either motivated by filling occupancy on desired days and accepting a lower base rate, or renting out the apartment for a higher rate and risking supply to be empty.
- The interviewees do not commonly agree about the price recommendation tool provided by Airbnb. While some hosts perceive it as a good rate recommendation, others identified the rates set as too low.
- Seasonality and events were identified as main influences for market demand changes. While information is publicly available, not all hosts are aware of the impacting events in their market.
- All participants use the dynamic pricing feature that Airbnb provides. However, it seems that “playing” with rates and booking is performed more commonly than applying strategic pricing decisions.
- None of the participants has used third party service providers to manage their supply. While they see advantage in their services, they seem more applicable for rentals of several properties.

4.5 Perspective 2: Revenue Managers

Success factors of revenue management
While REVM1 describes revenue management (RM) simply as "changing the rate according to demand", REVM3 explains the success of RM as "knowing your business and knowing the hotel and history". Analysis of historical performance and consistently analysing "prices for every single business mix" is essential for reacting and refining a hotel's strategy. REVM4 sees the success of RM in reviewing the numbers at all times and "creating the pickup for the year" in order to predict and adjust future performance.

REVM2 takes a more detailed approach explaining the improvements of RM over time. The definition of revenue management has expanded from "selling the right room at the right price to the right customer" into a more granular focus: "selling the right room, with the right restrictions, for the right lengths of stay, to the right customer and so on". He concludes that practicing revenue management became highly complicated and should therefore be defined best as "science of maximising revenue by all means necessary".

4.6 Pricing considerations for Airbnb hosts

The second set of questions asks how RM practices can help Airbnb hosts make better business decisions. The common perspective is to keep things simple and manageable. REVM2 illustrates that "revenue management came first before any tools". The revenue management cycle – monitor, forecast, optimize, control - can even be simplified as "put many trackers on Microsoft Excel spread sheets and monitor them". REVM2's advice is to "know your own data. This is something you don't need a study degree for to keep tracking on your bookings". He also suggests that Microsoft Excel is commonly available to help "understand your seasonality, when you have the most booking requests".

The main difference between hotels and Airbnb is the operating supply. REVM1 points this out as the main difficulty - "with one bedroom you only have one chance to get it right". He further elaborates that regulations may restrict a host to only rent a property for a certain number of days per year. In this case the main consideration is "when to allocate". This can either be done throughout a season or by "dividing it into certain periods within the year". REVM4 recommends tracking high demand periods...
and "creating a low-season, mid-season and high-season", with a need to "know which day of the week is the highest".

REVM1 emphasizes particularly on market research and location: "maybe there is a concert venue nearby that could potentially lead to more demand, maybe a sporting venue, maybe a wedding venue". Demand does not always derive from the obvious and can lead to a competitive advantage when segmenting the right target market.

REVM2 introduces the concept of applying restrictions to Airbnb. "The simplest restriction would definitely be the minimum lengths of stay". Using a simple tool, such as a demand calendar, can help clarify particular demand periods: "you should not unrestrictedly keep your apartment available for one-night stays, because the one-night stay may ruin your entire high season". Further restrictions suggest keeping short lead-times for highest anticipated demand periods, "closing for arrivals on certain days of arrivals or departure" and applying dynamic pricing to "flex your rates towards the demand". The following data example shows the practical relevance of setting restrictions during high demand periods.

**Data example: Opportunity for Airbnb to apply restrictions**

Days with high occupancy rates for hotels do not always follow the same trend line for Airbnb supply. The supply on 29 April was indicated as “high availability” on the Airbnb website, while at the same time hotels reached almost 100% occupancy levels around the O2 Arena in London. Revenue Managers advise using minimum length-of-stay restrictions to bridge the high and low demand days for Airbnb and only accept bookings that cover low demand days. These restrictions help to achieve higher occupancy rates over longer time periods and at the same time adjust pricing to achieve higher rates, as REVM2 confirms.
The discipline of revenue management demonstrates that it requires full-time attention to data collection, interpretation and both proactive and reactive decision-making with thorough planning. Moreover, concepts and tools can be simplified overall and still allow Airbnb hosts to make independent and informed decisions. The spill-over of knowledge mainly lies in the experience a host gains over time about their own performance, understanding their specific market segment and making the right decisions through data.

**Summary: Perspective 2 – Revenue Managers**

- The discipline of RM is perceived as a full-time commitment requiring high attention to detail, continuous monitoring of performance and decisions driven by data. RM aims to maximise revenues through the distribution and pricing of all available supply.
- Understanding RM concepts is more important than understanding systems, as performance (listing, competitors, market) can be recorded in Microsoft Excel.
- Restrictions are key concepts to maximise rate opportunities or secure higher booking volumes for specific demand periods, when guests are willing to pay a higher rate.
- Revenue managers suggest comparing data to alternative sources in order to gain better understanding of demand changes.
- The significant difference between hotels and individual Airbnb supply is that hosts mostly have only one chance to maximise their revenue. Strategic decisions are essential to achieve higher rates and occupancies.
4.7 Perspective 3: Benchmarking Experts

Comparisons between the trend Airbnb and the hotel industry

The interviews conducted with benchmarking experts from different fields within the hospitality industry showed that answers differ and are less streamlined compared to the answers provided by revenue managers.

BEN1 and BEN3 commonly agree that Airbnb and hotels can compete in the limited service segment, such as hostels, economy and midscale hotels, but do not see Airbnb competing in higher tier segments such as luxury. BEN1 explains that “people are willing to pay a lot of money for these services and this is something the sharing economy does not really offer”. In regard to the luxury hotel segment BEN3 notes that specific markets, such as the upscale market in Paris, have seen competition through Airbnb for luxury listings that also offer additional services, for instance concierge services. Commonly the interviewees see Airbnb as a new type of supply available in the industry. BEN4 mentions that the “Airbnb phenomenon” has opened up the market’s client base over time and is not only attracting young travellers, but has now expanded to other customer types as well. Benefit through benchmarking

The overall response to the question of whether Airbnb hosts can benefit from benchmarking practices was affirmative. “If used wisely, it can help them to increase their occupancy and rates” (BEN1). BEN2 specifies that knowing “your market and the more you know about your competitors” the better your yield possibilities become, which will then require “flexible” rates.

BEN3 suggested that the diligence of benchmarking “depends on the goals of the host”. A host who is “just looking for a little bit of extra cash” would likely not be concerned about optimizing rates or strategic benchmarking, while a host looking for long term rental and income would have to take a more strategic approach with “more education” required. For example, BEN2, points out that if a host does “not rent out throughout the whole year” to “identify” those periods that guarantee highest occupancies and highest average daily rate (ADR). Collecting “market intelligence” can be challenging and depends how advanced a host is in making use of this data. Strategic benchmarking would hereby compare a listing to an individual “Compset”, work with “online rate shopping” and “consider commissions and other add-ons” that
hotels use, in order to understand what “the guest is willing to pay” and how high rates can be pushed for Airbnb or accepting the premium of stay in a hotel.

**Data example: Understanding special events and their impact**

How impactful special events can be and how they affect pattern changes is demonstrated in the example below. The midscale and economy hotels ad-hoc set achieved GBP 194.6 on the day of the boxing event. Occupancy increased to 98.3%, while at the same time only 8 Airbnb properties were listed on the website. This shows that not only hotels took advantage of the event, also Airbnb hosts identified their opportunity for renting out their supply.

![Daily Hotel Performance](image)

**4.8 Strategy through benchmarking**

The majority of participants agreed that benchmarking and getting a proper understanding of market conditions is strongly research-driven, to the point that “this is becoming an extra job for them and not like a hobby” (BEN1). BEN2 said, it “would be very similar to how it is done in the hospitality industry”, and “revenue management requires a certain mind-set and not everyone easily gets into that”.
4.9 Perspective 4: Online Travel Agencies

OTAs perspective on Airbnb and hotels

Similar to the interviews with benchmarking experts, participants in the online travel agency (OTA) interviews share different perspectives, when comparing hotels and Airbnb. OTA1 states that from a supply perspective there can be a “strong effect on occupancy in certain markets”. OTA2 notes that it is very difficult to “quantify and measure how Airbnb is competing” against hotels. The general consensus from the OTA’s perspective is that Airbnb and hotels are only comparable through the supply offer, which causes disruption, however, the sharing economy does not compete with the “full range of services” (OTA3) and is therefore not a comparable product. In contrast, it has to be considered that Airbnb’s product has transitioned over time, from shared rooms to offers of entire apartments.

OTAs can be used as an alternative source of research for Airbnb hosts to “see their comparable apartment and get an idea on pricing” (OTA1). These findings and data can be compared to Airbnb pricing tool and contrasted with Airbnb price recommendations. More than the pricing element, OTAs provide information on market availability and filled supply. This information can support pricing decisions when hotels are filling up capacity and demand spill-over opens for Airbnb supply.

When it comes to initial price setting, OTA supply can be reviewed according to their standards and amenities available in a certain location. As OTA2 mentions “Airbnb is struggling putting this standardization in place”.

<table>
<thead>
<tr>
<th>Summary: Perspective 3 – Benchmarking Experts</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Benchmarking practices can help Airbnb hosts achieve higher performances. The benefits of benchmarking depend on the individual goals and how much diligence and time hosts invest.</td>
</tr>
<tr>
<td>• Benchmarking is segment specific. Hotel segments, such as economy and midscale are more comparable to Airbnb than the high-end segments, due to the limited service component. Markets behave differently and have to be analysed according to their individual characteristics.</td>
</tr>
<tr>
<td>• Governmental regulations and legal restrictions will be a key issue for the future of Airbnb.</td>
</tr>
<tr>
<td>• Rate shopping and compset benchmarking are common practices in understanding market demand and price changes. Benchmarking will always consider market conditions and the knowledge of what other accommodation providers offer.</td>
</tr>
<tr>
<td>• The aspect of rate maximisation can be seen critically in regard to the initial purpose of the sharing economy. Professionalising this trend may bring harm to the concept in the long term.</td>
</tr>
</tbody>
</table>
After the initial price setting, hosts need to research event drivers in the market and “understand the segment they are going after” (OTA3); “a dentist conference is probably not going to affect them (Airbnb hosts) as much as, let’s say, Dreamforce and Salesforce, where you would have a demographic of people that would very likely book on Airbnb”. Event impact and demand spill-over has to be evaluated from a segmentation perspective in order to identify rate opportunities.

4.10 Use of OTA distribution in addition to Airbnb
OTA4 explains that using an additional channel can help the efficiency of promoting a host’s apartment, “which may be more expensive, but have a wider reach”. OTA3 mentions the commission base for “independents” ranges “from 18-25%” for booking.com or Expedia. Airbnb commissions are much lower but covered by the host and primarily the guest. This may be a reason that OTAs are less focused on independent listings and a reason that only a few hosts “are using multiple channels” (OTA4).

In contrast, OTA1 observed “more and more OTAs getting into this apartment product” and “home owners are probably more and more trying to sign up to OTAs”. In terms of future development, she asks “why would an OTA miss out on that”, meaning to expand business into individual listings and targeting “similar customers”.

4.11 Knowledge transfer from OTA to Airbnb
Similar to hotel benchmarking, Airbnb hosts can analyse “how they price compared to their compset” (OTA1), when evaluating performance against sets of competitors in the market. Owners that manage more than one listing and therefore use Airbnb to a more professional level may benefit from other OTA distribution and services, as “they have a bigger need to really sell these apartments at the best possible rate”. OTA2 introduces rate scraping insights that can be purchased from specialized third-party data providers.

OTA2 concludes that channel distribution depends on the demand situation: “put more availability on Airbnb on higher demand, as you have lower commissions, and on lower demand days you could actually throw them on Booking.com, Expedia and meta-search engines, if you want to build that cash on hand”.

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5.0 Discussion

This study has identified that users running Airbnb as a professional business differ in motivation from those simply seeking for some extra revenue. Being booked at the desired dates is often more important than maximising revenue opportunities. The qualitative research has also shown that price setting and dynamic pricing are generally used and applied through trial and error. Even though hosts identified Airbnb rate suggestions as too low, the effort required for in-depth market analysis and planning appears challenging for some hosts. Airbnb’s pricing tool seems to be aiming for higher likelihood of securing a reservation, rather than achieving higher yields. Discounting rates is therefore a more common practice than using rate restrictions, a practice which is less effective for price maximisation. The data examples found that dynamic pricing is not always applied in general and that benchmarks did not consistently follow hotel trends.

6.0 Limitations and Further Research

The sample was representative with respect to the intended diversity of answers within the four knowledge groups. However, the small size of the sample means that findings are not generalizable; to confirm the findings of this study a larger or different sample of interviewees is needed.

It was not possible to investigate the experience that each interviewee brought into the interviews. There is a potential bias in the experience available amongst the

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Summary: Perspective 4 – Online Travel Agencies

- Participants describe Airbnb as a disruptor to the hotel industry, due to the supply competition. However, this competition concerns mainly the limited service sector.
- OTAs can be used as an alternative source of research for Airbnb hosts, in order to get a better understanding for pricing, market demand and market availabilities.
- Competet benchmarking can be applied to apartments by comparing to alternative accommodation and therefore have a better understanding of demand and price changes.
- OTAs can be used as an alternative distribution option, especially during low demand periods, to increase the likelihood for reservations.
- Understanding different guest segments (such as young & price sensitive travellers, young business travellers, older generation leisure travellers and event seeking visitors) can result in better targeting and therefore higher rate/occupancy opportunities. This knowledge can differentiate a listing from competitors.
interviewees. Future research should consider actual market averages taken from a larger sample, in order to identify rate actuals compared to hotel performance levels.

References


An investigation of discovering business processes from operational databases

Abstract

Process discovery techniques aim to discover process models from event-logs. An event-log records process activities carried out on related data items and the timestamp where the event occurred. While the event-log is explicitly recorded in the process-awareness information systems such as modern ERP and CRM systems, other in-house information systems may not record event-log, but an operational database. This raises the need to develop process discovery solutions from operational databases. Meanwhile, process models can be represented from various perspectives, e.g. functional, behavioural, organisational, informational and business context perspectives. However, none of the existing techniques supports to discover process models from different perspectives using operational databases. This paper aims to deal with these gaps by proposing process expressive artefacts based on process perspectives adopted in the literature, as well as discussing how these artefacts can be extracted from data components of a typical operational database.

Keywords: Process Mining, Process Perspectives, Expressive Artefacts, Business Process Management.

1. Introduction

Process mining has been emerged and become a well-established discipline in the last two decades. Process mining aims to discover, monitor and enhance business processes. Three main applications of process mining are process discovery, conformance checking and process enhancement (W. van der Aalst 2016). The idea of process discovery is to construct process models with information learned from the event log. Then, the discovered process can be represented by popular notations for process modelling such as Petri-net, Business Process Modelling Notation (BPMN), Causal net, among the others. Conformance checking techniques screen an event log to detect deviations between the log and a given process model. The output of this analysis can be used to enhance the “as-is” to “to-be” business process.

Process models play an important role in process mining as they are the target of process discovery. Process models are represented by process modelling languages such as Petri Net (Van Der Aalst 1998) and BPMN (OMG 2011). Also, process models can be described from different perspectives (Curtis, Kellner, and Over 1992). Each perspective illustrates a specific view of the business process. For instance, a functional perspective shows what activities performed in the process. Behavioural perspective indicates the sequence of these activities. Organisational perspective considers participants involving in each activity, and informational perspective
describes data objects manipulated by each activity. A process model may contain one or more perspectives depends on user interests and the levels of complexity of the model. The detail on process perspective is described in Section 2.1.

Many process mining techniques have been proposed to provide insights from different angles of business activities in organisations (W. van der Aalst 2016). Most of these techniques require “flat” event log as input. Event log, which is the heart of process mining, should be treated as “the first citizen” (W. van der Aalst et al. 2012). An event-log captures all data relevant to a business process, i.e. contains a set of traces corresponding to instances of a process. Each of the traces includes a set of events representing actions or operations performed in the system. Relevant attributes are also logged to provide semantic meaning to events, traces and the whole process. Example of the event log is shown in Figure 1. Normally, event logs can be easily extracted from process-awareness information systems which are “a software system that manages and executes operational processes involving people, applications, and/or information sources on the basis of process models” (Dumas, van der Aalst, and ter Hofstede 2005). Logging process activity execution is a critical part of such systems and the log is perfectly fit with the requirements of an event-log for process mining techniques. However, traditional systems, i.e. non-process-oriented software such as in-house developed or functional-based software, does not provide event log. Traditional systems typically record transactions into relational databases, forming operational databases. Operational data is stored by category, i.e. data of the same category (e.g. Order, Payment, Customer) is recorded in the same table and tables are linked through the primary key-foreign key mechanism. Hence, there is no explicit event log or even the logging data which can be easily transformed to the event log in such information systems. Consequently, it is not trivial to discover and monitor the business process in such traditional information systems.

<table>
<thead>
<tr>
<th>Case Id</th>
<th>Activity Id</th>
<th>Activity Name</th>
<th>Timestamp</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Place Order</td>
<td>2018-10-11 13:00:04</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>Payment</td>
<td>2018-10-12 13:00:04</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>Shipping</td>
<td>2018-10-11 13:00:04</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>Place Order</td>
<td>2018-10-15 09:23:06</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>Payment</td>
<td>2018-10-15 09:23:06</td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Several techniques have been developed to apply process mining based on relational databases. For example, Wil M. P. van der Aalst (2015) proposed a notion of event model built on top of data schema to generate event log data. The data schema is also used to correlate event and build event log (Li, Medeiros de Carvalho, and van der Aalst 2018). In addition, Nooijen, van Dongen, and Fahland (2013) developed an automatic approach to discover business processes from a relational database based on data summarisation and clustering techniques. Other solution to utilise operational database for process mining is using redo log (Murillas, Aalst, and Reijers 2015). While these works proof the possibility to apply process mining based on operational databases, none of them supports to discover business process from different perspectives. It is a missing gap needed to be filled, which would give organisations better insight into their operations from various points of view based on process mining.

The first step is to investigate if it is possible to discover business processes from different perspectives using operational databases. To solve this problem, we develop a set of expressive artefacts based on the concepts of process perspectives extracted from the literature. These are functional, behavioural, organisational, informational and business context perspective. They are the most critical information that a business process model needs to cover. Then, we review data components in a typical relational database and assess if they can partly or entirely provide information about expressive artefacts.

This paper includes five sections. Section 1 introduces the context and raises research problems. Section 2 introduces the basic concepts used in the paper including process perspectives and operational database. Section 3 proposes expressive artefacts in process models based on the concept of process perspectives. The assessment of the possibility that data components of object-centric databases can be used to discovered process expressive artefacts is given in Section 4, followed by the conclusion and future works in Section 5.

2. Preliminaries
2.1. Process perspectives
Organisations are running through business processes. Their business importance is already shared among many executives. Weske (2012) defined a business process as
of a set of activities that are performed in coordination in an organisational and technical environment. These activities aim to achieve a business goal. A business process may interact with other business processes performed by other organisations. Process mining is becoming popular to help organisations to discover and monitor business processes.

The outputs of process mining techniques are typically process models represented by business process modelling languages (BPM), e.g. Petri Net and BPMN. To accommodate the goal of reflecting a business process, a model must have the capability of providing various informational elements to its users. Such elements include, for instance, what activities/tasks needed to be performed in the process, who conducts these activities, when and where the activities are completed, how and why they are executed, and what informational entities they manipulate. BPM languages vary in the extent to which their constructs express the information that answers these questions. A modelling technique can represent one or more of the following “process perspectives” consisting of “functional”, “behavioural”, “organisational” and “informational” (Curtis, Kellner, and Over 1992). These terms are mentioned in (Giaglis 2001) and (Mili et al. 2010) as purposes of designers when they construct a business process model. Also, these concepts of perspective have been widely adopted in the literature (Daoudi and Nurcan 2007; Ben Hassen, Gargouri, and Turki 2016; List and Korherr 2006; Letsholo et al. 2014; Hommes and van Reijswoold 2000).

While these perspectives adequately cover information in a single process model, they do not consider the factors of business goals as well as the relationships among processes. Therefore, we need to extend to additional aspects. List and Korherr (2006) extends to business context perspective which refers to overall information of a business process. This perspective is similar to the intentional perspective mentioned in (Ben Hassen, Gargouri, and Turki 2016). In general, they cover the alignment of a business process to its business context such as the overall goals of the process, roles in a broader context and collaboration with other processes. In this article, we use five process perspectives consisting of functional, behavioural, organisational, informational and business context.

- The functional perspective covers the information of what process elements (activities) are being performed.
• The behavioural perspective covers the information of when activities are performed (for example, sequencing) as well as aspects of how they are performed through feedback loops, iteration, decision-making conditions, entry and exit criteria, and so on.

• The organisational perspective covers the information of where and by whom activities are performed.

• The informational perspective covers the information of the informational entities (data) produced or manipulated by a process and their interrelationships.

• The business process context perspective captures critical business process information such as process goals and objectives, input and output of the process as well as the relationship between a business process with other processes in the organisation.

2.2. Operational database

Enterprise information systems typically provide interfaces for interaction with users, i.e. users operate transactions related to one or a set of business objects, e.g. order, customer, payment, on each interface. For example, an e-commerce information system may have different interfaces for Order Management, Customer Relationship Management, Payment, Shipment Arrangement. These transactions then are stored in a relational database, forming an operational database. Transactions of the same category or business object (e.g. Customer) are recorded in the same table (e.g. Customer table) in the database. Also, a table in the database may have relationships with other tables through a primary key-foreign key (PK-FK) mechanism.

Figure 1 shows an example of an object-centric relational database extracted from Odoo, an open source ERP (Enterprise Resource Planning) system. Nine tables are corresponding to different business objects such as Order, Delivery, Customer and Invoice. Each table has a primary key (a field name in bold), one or many foreign keys (a field name in italic-bold) to indicate its relationships with other tables, and other columns (fields), along with data rows.
Figure 1. An object-centric relational database in an ERP system

A typical relational database constitutes data components described as follow:

- **Table and Table name**: Tables are the key components of the relational database. A table is used to store information of the same category. A table consists of records. Every record is divided into a field that has a specific data type (e.g. integer, text, DateTime). The table name should refer to the business object whose data is stored in that table.

- **Primary key**: Each table should have a primary key. The primary key is the field that contains unique values. In other words, a primary key is the identifier of a table record.

- **Foreign key**: Foreign keys are particular fields used to connect tables in a database. A foreign key of a table is typically a copy of a primary key of another table, indicating the relationship between them.

- **Field**: Fields are columns of a table. Each field has a particular datatype. The field name may semantically indicate information type in the table (e.g. Username, product name).

- **Data integrity constraint**: Data integrity is applied in a relational database by a set of rules or restrictions. Three types of data integrity can be considered including entity integrity, referential integrity and domain integrity.

- **Redo logs**: Most modern relational database management systems (RDBMSs) provide many mechanisms to ensure data consistency. One of these
mechanisms is redo log, which consists of a set of files in which database operations are recorded before being applied to the actual data. This allows to roll back the state of the database to previous points in time, undoing the last operations affected the database based on redo log files. Example of a redo log can be seen in Table 2 below:

<table>
<thead>
<tr>
<th>#</th>
<th>Timestamp</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2018-10-11</td>
<td>INSERT INTO “ORDER” (id, create_time, user_id) values (“so1”, “2018-10-11 13:00:04”, u1)</td>
</tr>
<tr>
<td></td>
<td>13:00:04</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2018-10-11</td>
<td>INSERT INTO “SALE_ORDER_LINE” (id, sale_order_id, product, quantity, price) values (sol1, so1, phone, 1, 534)</td>
</tr>
<tr>
<td></td>
<td>11:34:23</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2018-10-11</td>
<td>INSERT INTO “SALE_ORDER_LINE” (id, sale_order_id, product, quantity, price) values (sol2, so1, TV, 1, 467)</td>
</tr>
<tr>
<td></td>
<td>11:37:23</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Redo log example

3. Expressive artefacts in process models

We use five process perspectives adopted from the literature, including functional, behavioural, organisational, informational and business context. In each perspective, we propose a set of expressive artefacts constituting a business process. Each artefact refers to an informative element about an aspect of a business process model. While some artefacts are mandatory to construct a business process, others may be optional. Table 3 below lists expressive artefacts with their explanations.

<table>
<thead>
<tr>
<th>Process Perspective</th>
<th>Expressive Artefact</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional</td>
<td>Activities</td>
<td>Activities are a set of tasks need to be performed in a business process. An activity can be at a high level, i.e. it contains a set of low-level activity (atom activity). For example, an activity of “Contact Customer” may contain other activities such as “Query a customer” and “Update customer profile”. Activities are mandatory artefacts to construct a process model.</td>
</tr>
<tr>
<td></td>
<td>Decision points</td>
<td>The points indicate the route of the workflow, based on specific conditions. For example, if the order value is higher than 2000, it will be sent to the Director for review. Otherwise, it will be sent to the</td>
</tr>
</tbody>
</table>
inventory department. Here the routing point is after the order is placed, and the routing condition is “higher than 2000”. Decision points are optional artefacts as some processes may be linear, i.e. all activities are sequentially performed.

<table>
<thead>
<tr>
<th><strong>Activity types</strong></th>
<th>This artefact refers to a type of activities in the business processes. For instance, an activity can be manual or automatic and start or complete. This artefact is optional.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Behavioural</strong></td>
<td>This artefact defines sequential conditions make activities performed in the business processes. For example, step B is performed after step A. This artefact is mandatory as it is essential to see the order of the activities in the business processes.</td>
</tr>
<tr>
<td><strong>Routing condition</strong></td>
<td>Decision points require specific conditions to route the workflow to a certain way. This artefact is optional; however, it becomes mandatory if the business process contain decision points.</td>
</tr>
<tr>
<td><strong>Organisational</strong></td>
<td>Role/Actors are responsible for performing activities in the business process. Typically, an activity is assigned to a human agent. In some case, an activity can be automatically implemented by the system. Although it is not necessary to indicate activity role in a process model, this artefact will give useful information about the responsibilities of process participants.</td>
</tr>
<tr>
<td><strong>Role relationships</strong></td>
<td>Role relationship refers to the communication between actors involving in a business process. This artefact is optional.</td>
</tr>
<tr>
<td><strong>Informational</strong></td>
<td>This artefact refers to data objects manipulated by activities in the business processes. For example, in the activity of “Place Order”, a new order is created in the table “Order”, and information of ordered items are added in the table “Order Line”. This artefact is optional in a process model.</td>
</tr>
<tr>
<td><strong>Decisive data objects</strong></td>
<td>This artefact describes data objects and values needed for deciding decision points in business processes. This artefact is optional.</td>
</tr>
<tr>
<td><strong>Data value transformations</strong></td>
<td>Values of data objects in the database can be modified after every action is performed in the process. This artefact refers to the ability to record and monitor value changes in relevant data objects across the business process.</td>
</tr>
<tr>
<td><strong>Business Context</strong></td>
<td>This artefact describes information about the purposes of a business process within organisational view. This artefact is optional.</td>
</tr>
<tr>
<td><strong>Process collaboration</strong></td>
<td>This artefact indicates the collaboration of the process with other processes in the organisation.</td>
</tr>
</tbody>
</table>

Table 3. The expressive artefact in process models
4. Discuss the possibility to discover expressive artefacts from operational databases

In this section, we investigate the possibility to extract expressive artefacts (in section 2) from the object-centric database. We discuss if data components in operational databases can be used to retrieve expressive artefacts at two coverage level including (+): fully coverage and (+/-): partly coverage. Fully coverage means the value of the data component can explicitly refer to an artefact while components with partly supporting level may need additional information to construct corresponding expressive artefacts. Along with the analysis, relevant articles are provided as references if they use the data component to extract the corresponding artefacts. The evaluation is summarised in Table 4. All the examples we use in the discussion refer to the object-centric relational database in Figure 1.

<table>
<thead>
<tr>
<th>Data component</th>
<th>Potential discovered expressive artefacts</th>
<th>Coverage level</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Table name</strong></td>
<td>Activities</td>
<td>+/-</td>
</tr>
<tr>
<td></td>
<td>Activity data objects, Decisive data objects</td>
<td>+</td>
</tr>
<tr>
<td><strong>Primary key</strong></td>
<td>Activity-performed conditions</td>
<td>+/-</td>
</tr>
<tr>
<td><strong>Foreign key</strong></td>
<td>Activities</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Activity-performed conditions, Routing conditions</td>
<td>+/-</td>
</tr>
<tr>
<td><strong>Field</strong></td>
<td>Decision tracking field</td>
<td>+</td>
</tr>
<tr>
<td>Decision points</td>
<td>Decision points</td>
<td></td>
</tr>
<tr>
<td>Activities</td>
<td>+//-</td>
<td></td>
</tr>
<tr>
<td>Activity-performed conditions</td>
<td>+/-</td>
<td></td>
</tr>
<tr>
<td>Activity Role/Actors</td>
<td>+//-</td>
<td></td>
</tr>
<tr>
<td>Role relationship</td>
<td>+//-</td>
<td></td>
</tr>
</tbody>
</table>

The evaluation is summarised in Table 4. All the examples we use in the discussion refer to the object-centric relational database in Figure 1.
<table>
<thead>
<tr>
<th>conditions</th>
<th>Redo logs</th>
<th>Activities, Activity-performed conditions, Activity Role/Actors, Data value transformations.</th>
</tr>
</thead>
</table>

Table 4. Evaluation of the possibility to extract expressive artefacts based on data components in operational databases

We illustrate the extracting process from the database of the schema in Figure 1 based on the guidelines in table 4 as follows:

4.1. Functional perspectives

Table names can also be used to extract process activities. In some case, one may need information from other sources (e.g. domain knowledge) to identify activities, especially to discover high-level activities in a business process. For example, in the database in Figure 1, one may need to be familiar with the process to identify “Place Order”, “Approve order”, “Shipping item” activities based on Order, Order Line, Delivery and Delivery Line tables (see in Figure 2). Furthermore, we can combine two or more activities from tables (e.g. Create Sale Order and Create Sale Order Line) to build a higher-level activity (e.g. Place Order).

Timestamp-related fields are also helpful to define process activities. For instance, if the “Order” table contains the field for tracking updating records, e.g. modified date, one can identify that the order can be modified in the processes and that the process contains an “Update order” activity. However, as the timestamp-related fields merely record the current status (e.g. “last update date” field) of the database, the previous status can be missing from the discovery (e.g. an order can be modified three times, but only the last time is recorded). In this case, additional data sources are needed (e.g. redo log) to avoid missing process activity when discovering the process.

The primary key can be used to identify when activities are performed, along with relevant information such as identifiers for activities and process instances. Likewise, a foreign key can be used to extract process activities.

Decision tracking fields can be a good source of detecting decision points in a business process. For example, one can rely on the “Status” field in “Order” table to determine that there should be a decision point after an order is placed. Depending on a specific condition, an order can be “approved” or “rejected”. This approach is potential and needs more attention to develop a complete solution.
4.2. Behavioural perspectives

Timestamp-related fields are the most appropriate data components to discover the sequence of process activities. For instance, in Figure 3, with the create_date field, one can determine the “Place order (so1)” activity was performed before its payment, followed by the corresponding shipment.

In some case, the primary key may reveal the order of activities if the database uses auto-increment keys (e.g. auto-increment integer number) that we know the row with higher value key is created after the one with lower value key. Furthermore, foreign key, in combination with referential integrity constraint, reveals a part of information about the order of activities in the business process. For example, “Delivery_Line” table contains foreign keys which are “delivery_id” and “order_line_id” linking to the “Delivery” and “Sale_Order_Line” tables respectively. It means that the records (e.g. dl1) in “Delivery_Line” table should be created after the corresponding records in “Delivery” table (e.g. d1) and “Sale_Order_Line” table (e.g. sol1), indicating that the activity of delivery an item should be performed after the item is ordered. This information would be helpful when these tables contain
issues such as missing timestamp in individual records. However, there has been no effort implementing this idea in the context of process mining from the literature.

Data integrity constraints can be used to extract many expressive artefacts. We focus more on the possibilities to extract behavioural perspective artefacts. Along with the idea of referential integrity constraints mentioned above, domain integrity constraints may reveal sequential order of activities. For example, with a domain constraint such as “no payment can be made for a rejected order”, one may determine that the payment activity should be implemented after the corresponding order is placed and approved. Although this idea is potential, developing a general approach based on data integrity constraints is not trivial because the constraints vary and are set up for specific business contexts.

Figure 3. Example of extracting behavioural process perspective using timestamp fields

4.3. Organisational perspectives

User tracking fields (e.g. “create_user” or “modified_by”) appears to be the only way to know participants taking part in certain activities in the business process. For example, if the record “d1” is created by “user1”, “user1” should be the one assigned to deliver items. Meanwhile, the “Role relationship” artefacts cannot be explicitly extract merely based on the operational database. It may need more support from
social network process mining techniques (Wil M. P. van der Aalst and Song 2004) and tools (W. M. P. van der Aalst et al. 2007).

Figure 4. Extracting organisational perspective process from the operational database

4.4. Informational perspectives

Table names are a sufficient source of informational perspective artefacts, as they provide data object manipulated by business processes. For example, if one use “Order” and “Order_Line” tables to identify “Place Order” activity, apparently the activity manipulates two data objects including Order and Order_Line.

Redo log is a convenient source for expressive artefact extraction. As redo logs record all data queries sent by users and the system during the process, this data components can provide information about most of the expressive artefacts across process perspectives, especially for data value transformation which needs to track the change of the database states after conducting each process activity. However, the limitation of this approach is that the redo log is not an essential part of an operational database. They are typically integrated into database management systems with various logging and storage structure. Moreover, data administrators may remove a part of the log (e.g. cleaning the last year log) to ensure the storage ability of the system server, resulting missing information to extract expressive artefacts. Other problem is that when one uses an event in redo log to roll back the corresponding
transactions, the relevant event is no longer valid to be included in the process. Hence, this data component requires more attention to ensure the data validity and consistency of the discovered process.

4.5. Business context perspectives

With the relationship between tables in the operational database schema, one may identify the collaboration between discovered business processes. For example, in Figure 4, one may discover two processes consisting of “Order” and “Payment” from the operational database. The Order process includes “Place order”, “Make an invoice” and “Shipping” activities while the Payment process includes “Select invoice” and “Make a payment” activities. As both processes share the invoice data and there is a relationship between Payment, Payment_Line and Invoice tables, the collaboration between “Order” and “Payment” processes can be defined, indicating that both processes are related to each other. More advanced modelling techniques are necessary to represent this perspective, such as Proclet (Van Der Aalst et al. 2001) and Relational business process (Steinau, Andrews, and Reichert 2018).

Figure 4. Discover process collaboration from the operational database
5. Conclusion and future work

In this paper, we propose expressive artefacts from five process perspectives (including functional, behavioural, organisational, informational and business context) which are essential to construct a business process model. Then we assess the possibility to discover these artefacts from data components in an operational database. Several ideas to extract expressive artefact based on the database are proposed with a demonstration from an example where possible.

According to our analysis, data components of an operational database can fully provide information about expressive artefacts of “Activities”, “Activity data objects”, “Decisive data objects”, “Decision points”, “Activity performed order”, “Activity role/actors”, “Data value transformation”. However, they merely contain a part of the expressive artefacts of “Activity types”, “Routing condition” and “Role relationship”. One may need extra information from different sources to fully extract these artefacts, and we need to develop more formal techniques to fill this gap. Meanwhile, all process goal in a business context perspective cannot be obtained based on the operational database. For this artefact, other sources need to be considered with a sufficient approach to combine with existing solutions. Note that when we assess each data component, we assume that the component is available in the database. Hence, if a database does not contain a specific component (e.g. user tracking field), it is impossible to extract process information from an organisational perspective. Existing researches merely develop techniques of extracting event log from operational databases, but they have not considered which perspectives and expressive artefacts covered by the operational database. In the future, we will deal with this problem. A set of measurement method will be developed, along with novel mining techniques to utilise all data components in the operational database.

References


Understanding Proximity Mobile Payment Adoption through Technology Acceptance Model and Organisational Semiotics: An Exploratory Study

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Abstract

Mobile technologies, in particular, smartphones are reshaping individual and organisational behaviour at different levels and pace. This research focuses on the multi-cultural use and acceptance of proximity mobile payment (m-payment) which is more prevalent in some countries than others. Previous analysis of m-payment adoption extended the Technology Acceptance Model (TAM) to include external factors of use and acceptance identified through Organisational Semiotics (OS). This paper presents the development of constructs and measurements based on the identified requirements for m-payment adoption. It also presents the exploratory study results to validate the salient factors. This study furthers m-payment research by addressing the technical and social aspects via TAM and OS, as well as identifying empirical factors to increase m-payment adoption in multi-cultural context.

Keywords: Mobile Payment, Technology Acceptance Model, Organisational Semiotics, Technology Adoption, Near Field Communication

1.0 Introduction

The popularity of mobile devices (smart phones, tablets, smart watches, etc) has significantly changed our everyday lives. Financial transactions are no exception. Near Field Communication (NFC) allows a contactless short-range communication facilitating data transmission between mobile devices and payment terminals. With the support of NFC, proximity mobile payment (m-payment) allows users with compatible mobile devices to use m-payment function via their mobile devices for financial transactions when their devices and Point of Sale (POS) terminals are within 10 cm. M-payment eliminates the need for customers to carry and use cash (Pham & Ho, 2015) and offers convenience and speed (Teo, et al., 2015). The use of proximity mobile payment (m-payment) is expected to exceed the revenue of 930 billion US dollars globally (Statista, 2018). However, according to WorldPay (2017), whilst 30% of
customers have used mobile devices for contactless (tap and go) payment, 75% of customers prefer to use their credit or debit cards for contactless payment in the UK. Since the advent of m-payment, researchers have begun to identify the factors of m-payment adoption, including perceived ease of use (PEOU) and perceived usefulness (PU) (Kim, et al., 2010; Koenig-Lewis, et al., 2015), trust (Lu, et al., 2011), security and risks (Arvidsson, 2014), costs (Peng, et al., 2011), privacy (Slade, et al., 2013), use context (Mallat, et al., 2009), culture (Alalwan, et al., 2015), and social influence (Peng, et al., 2011; Alalwan, et al., 2015). Technology Acceptance Model (TAM) and its extensions have been widely applied in m-payment adoption research, as they provide a framework to understand the variables influencing intention to use. Despite the popularity of mobile devices, the adoption of m-payment amongst mobile device users is still relatively low (Deloitte, 2015). Therefore, it is essential to further investigate the factors of adoption to identify the blocks as well as provide guidance to merchants on how to better encourage users to adopt m-payment. This paper presents the first phase of development through an exploratory study incorporating both social and technical adoption factors based on Technology Acceptance Model (TAM) and Organisational Semiotics (OS).

2.0 Literature Review

The aim of this section is to explore the various theoretical models proposed for technology use and adoption. Adoption models have roots in information systems (IS), psychology (Fishbein & Ajzen, 1977), and sociology (Davis, 1989; Venkatesh & Davis, 2000). However, many researchers ignore the social cultural aspects. Davis (1989) stated that group, cultural, or social aspects of decision making, and usage are not considered very much in technology acceptance research. The following sections provide background and context for this exploratory study through technology adoption, including TAM, and OS respectively.

2.1 Technology Acceptance Model (TAM) and Diffusion of Innovation (DoI)

TAM is used as a predictive and explanatory tool for testing user acceptance of technologies with the aim of understanding the impact of external factors on internal beliefs, attitudes, and intentions. TAM includes the deterrents of Perceived Usefulness (PU) and Perceived Ease-Of Use (PEOU) as shown in Figure 1. PU is defined as the
probability the user’s job performance will increase given use of a specific application, and PEOU pertains to how effortless the new system will be for the user (Davis, 1989). These two determinants, PU and PEOU, influence a user’s attitude toward using. In a recent review (Chhonker, et al., 2017) of adoption models, researchers found that most studies using TAM either used the original TAM constructs or extended TAM by adding new predictive constructs.

Diffusion of Innovation (DoI) explains how a new idea or product gains momentum and diffuses through a certain population. Researchers have applied DoI alongside TAM to investigate the adoption of m-payment (Luna, et al., 2018). There are five main factors that influence adoption of an innovation: relative advantage, complexity, compatibility, trialability, and observability (Rogers, 2003). The five key factors have been adopted to understand user acceptance of financial technologies (Al-Jabri & Sohail, 2012; Chen, 2008).

2.2 Organisational Semiotics (OS) in the context of M-Payment
Additionally, previous research extended TAM for proximity m-payment via Organisational Semiotics (Pan, et al., 2018) which will be expanded upon in this paper. Organisational semiotics (OS) is one of the social technical approaches for understanding the use of information systems in an organisation (Tan & Liu, 2013). OS roots in semiotics which is a study of signs (Peirce, 1935). OS is widely applied in the information systems studies where an organisation is seen as an information system, and signs are considered as information (Liu, 2000). In an organisation, norms are interpreted by all kinds of signs in an organisation (Stamper, 1985). A sign can either be an object or the effect produced by an object that conveys information. Norms always come into place before performing certain actions and the subsequent actions will generate more signs sooner or later.

The OS analysis of the social and technical factors of m-payment adoption by organisational containment analysis (OCA) and organisational semiotics framework
(OSF) can be categorised into six distinctive layers (Figure 2). OCA examines the informal, formal, and technical norms of the m-payment adoption. The informal norms refer to the society or community culture, customs and values in perceiving m-payment. The formal norms relate to the actual or an official usage of m-payment, whereas the technical norms refer to the feature of m-payment. OSF, on the other hand, delineates the granularity of signs (information) ranging from m-payment devices (physics, empirics, and syntactic layer), and the information perceived by the end user (semantic layer), to the effect or impact of signs (pragmatics and social layer).

<table>
<thead>
<tr>
<th>OCA</th>
<th>OSF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Informal</td>
<td>Human Information Functions</td>
</tr>
<tr>
<td>Social World</td>
<td>Social influence, peer pressure, perceived risks, confidence in service providers, culture…</td>
</tr>
<tr>
<td>Pragmatics</td>
<td>Time saving, convenience, accessible records, perceived advancement…</td>
</tr>
<tr>
<td>Formal</td>
<td>Semantics: Contactless financial transactions, regulations for financial transactions, service agreements, terms and conditions…</td>
</tr>
<tr>
<td>Technical</td>
<td>The Platform</td>
</tr>
<tr>
<td>Syntactics</td>
<td>Design and structure of M-payment application, compatibility, security protocol, encryption, verification, user guide…</td>
</tr>
<tr>
<td>Empirics</td>
<td>NFC, transaction platform, portal, internet connectivity, connection speed and liability, archives…</td>
</tr>
<tr>
<td>Physical World</td>
<td>POS terminal, mobile devices, server, cables, database…</td>
</tr>
</tbody>
</table>

Figure 2. Organisational Semiotics Framework (OSF) with Organisational Containment Analysis (OCA) for M-Payment

OSF and OCA contribute to the new conceptual model for understanding m-payment acceptance (see Figure 3), that will be used in this study to help develop the instrument to assess multi-cultural acceptance of m-payment. As this is a preliminary research, the first phase is concerned with developing a questionnaire to capture the user perspectives, focusing on the informal layer of OS, which consists of pragmatics and social. The formal and technical layers contain more tangible aspects of acceptance and thus will not be considered in this portion of the research.

3.0 Exploratory Study and Hypotheses Development

Scholars have applied OS (Al-Rajhi, et al., 2010) and DoI (Oliveira, et al., 2016) in extending the behavioural factors in TAM. Based on TAM, DoI and OS, this paper proposes a model (Figure 3) to further investigate m-payment adoption factors. The model can be explained as follows: m-payment acceptance can be evaluated in three
levels, technical (technology characteristics), formal (organisational antecedents), and informal (external environment). These three levels affect the intention to use and adopt m-payment. In this exploratory study, the informal level of variables is categorised into compatibility, perceived risks and personal innovativeness. The exploratory study survey will measure the key variables that could influence actual m-payment use (MU), which will also be captured in the survey. The following sections will address the variables and consequently develop the hypotheses.

![Conceptual Model for Understanding M-Payment Acceptance](image)

3.1 Social World (SW)

The social world pays attention to what and how the outside norms influence and are influenced by the system, e.g. social influence and peer pressure (Liu, 2000). An individual’s perception of the social norms and impact that he/she believes the use of a given technology will have, will determine his/her attitudes and intention towards the use of technology (Al-Rajhi, et al., 2010). Subjective norms based on individuals' perception of what people important to them consider on whether they should adopt could influence their decision of technology adoption (Venkatesh & Bala, 2008), such as m-payment (Schierz, et al., 2010). Therefore, the proposed hypotheses formulated for social world relation to m-payment are:

\[ H1: \text{Subjective norms determine a consumer’s perceived usefulness of m-payment.} \]
\[ H2: \text{Subjective norms determine the perception of the ease of use of m-payment by the consumer.} \]

3.2 Compatibility (C)

Compatibility is a key adoption factor that focuses on the innovation’s fit with user’s lifestyle depending on how consistent they perceived it to be with their existing values,
beliefs, behaviours, lifestyles, and experiences (Rogers, 2003; Chen, et al., 2004). Compatibility can be a significant predictor in consumers’ attitude towards financial technology adoption (Ndubisi & Sinti, 2006). Compatibility was found to be an important factor for m-payment as it combines technological innovation with values, behavioural patterns and consumer experiences (Luna, et al., 2018). This study proposes the following hypotheses to test the relation between compatibility and m-payment:

\[
\begin{align*}
H3 & : \text{A consumer’s perceived compatibility determines his/her perceived ease of use of m-payment.} \\
H4 & : \text{A consumer’s perceived compatibility determines his/her perceived usefulness of m-payment.}
\end{align*}
\]

3.3 Perceived Risks (PR)
Before adopting new technologies, users assess the two dimensions of potential risks, namely the level of uncertainty and the seriousness of impacts, to determine whether they are willing to take the risks (Featherman & Pavlou, 2003). Consumers will evaluate immediate and internal consequences to assess potential benefits or risks when adopting new technologies (Cho, 2004). Trialability refers to the extent to which an innovation can be experimented by users before commitment to adoption (Rogers, 2003), which could reduce users’ perceived uncertainty and lead to adoption (Tan & Teo, 2000). In addition, perceived risks could influence the adoption of financial technologies (Ndubisi & Sinti, 2006). The following hypotheses were formulated to test the relationship between perceived risks and m-payment:

\[
\begin{align*}
H5 & : \text{A consumer’s perceived security of m-payment determines his/her perceived ease of use of m-payment.} \\
H6 & : \text{A consumer’s perceived security of the m-payment determines his/her perceived usefulness of m-payment.}
\end{align*}
\]

3.4 Personal Innovativeness (PI)
Personal innovativeness refers to the willingness of a person to try a new technology (Agarwal & Prasad, 1998). Personal innovations could influence PU and PEOU (Parveen & Sulaiman, 2008), as well as behavioural intention (Leong, et al., 2013). The proposed hypotheses to test the relationship between perceived ease of use and m-payment are:
H7: The Personal Innovativeness of the consumer determines his/her perceived ease of use of m-payment.

H8: The Personal Innovativeness of the consumer determines his/her perceived usefulness of m-payment.

3.5 Perceived Ease of Use (PEOU)

Complexity is the extent to which an innovation can be considered relatively difficult to use (Rogers, 2003). Complexity is the opposite of ease of use. PEOU and complexity could influence user adoption (Davis, 1989; Rogers, 2003). The hypothesis for testing the relationship between PEOU and m-payment is:

H9: The consumer’s perceived ease of use of m-payment determines his/her attitude towards using m-payment.

3.6 Perceived Usefulness (PU)

Perceived Usefulness (PU) is the degree to which users believe that adopting a new technology will increase their effectiveness and performance (Davis, 1989). Studies indicate that PU has a relationship with attitude and intention to use (Huang, et al., 2013). The proposed hypothesis to test the relationship between PU and m-payment is stated as:

H10: The consumer’s perceived ease of use of m-payment determines his/her attitude towards using m-payment.

3.7 Attitude (ATT)

Attitude is considered a multi-dimensional construct, consisting of cognitive, affective, behavioural factors (Fishbein & Ajzen, 1977). User attitude could influence the intention of using m-payment systems (Schierz, et al., 2010), therefore the following hypothesis is formulated:

H11: The attitude (ATT) towards the use of m-payment with a mobile device determines the intention to use m-payment.

3.8 Behavioural Intention (BI)
Behavioural intention could lead to actual use. Users’ behavioural intention to adopt can be influenced by attitude (Davis, 1989), subjective norms (Fishbein & Ajzen, 1977) and personal innovativeness (Leong, et al., 2013). The hypothesis to test the relationship between intention and m-payment.

\[ H12: The\; intention\; to\; use\; determines\; the\; actual\; use\; of\; m\text{-}payment\; with\; a\; mobile\; device. \]

### 4.0 Exploratory Study Method

In order to explore and investigate new ideas scholars require broader understanding of different philosophical assumptions (Creswell, 2007). It is widely believed that the outcome of the exploratory study allows the scholars to explain proportions found in the literature and developed the research framework and then the questionnaire for the main study.

The data collection method selected was online survey targeting m-payment users. The online survey was used to reach a wider range of participants in order to collect more information about specific constructs and to explore the actual use of m-payment in different cultures. This survey will help the researchers to understand the current situation and future perspective of m-payment use.

A pilot survey for examination of user acceptance of NFC enabled m-payment was designed to test the eleven hypotheses highlighted in the previous section. Each of the constructs were exposed from a literature review of technology acceptance and organizational semiotics. The survey consisted of 37 questions comprised of 32 construct questions and 5 demographic questions. The survey instrument contained at least three measurement questions per construct except actual use of m-payment (MU), dependent variable, which only had two questions. In obtaining informed consent, participants were assured in the first page of the survey the data confidentiality, and their right to withdraw from participation at any stage of the study.

The online survey was released through social media websites, namely Facebook, Twitter, and LinkedIn. The data were collected from a total of 48 participants of which only 20 were complete records. Results from the exploratory study will be discussed in the following section.

### 5.0 Results from Exploratory Study
Data were collected from different demographic groups to identify several constructs that may influence the use of m-payment. The following sections report the demographic and constructs analysis.

5.1 Demographic Analysis

In this section, the profiles of the respondents in terms of age, gender, equational level, and culture are summarized and descriptive statistics can be found in Table 1.

<table>
<thead>
<tr>
<th>Respondents Characteristics</th>
<th>Number of respondents (n=20)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 to less than 31</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>31 to less than 41</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>41 to less than 51</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>51 to less than 61</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>61 and more</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school or Secondary Degree</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Professional degree (JD, MD)</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Bachelor’s degree</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>Master’s degree</td>
<td>9</td>
<td>45</td>
</tr>
<tr>
<td>Doctoral degree</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>Employment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employee full time</td>
<td>12</td>
<td>60</td>
</tr>
<tr>
<td>Employee part time</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Student</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Unemployed looking for a job</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Retired</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>Industry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educational Services</td>
<td>7</td>
<td>35</td>
</tr>
<tr>
<td>Professional, scientific or technical services</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>Information</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>Health care or social assistance</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Utilities</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Retail trade</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Mining</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Management of Companies of enterprises</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>No of Respondents per country</td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>9</td>
<td>45</td>
</tr>
<tr>
<td>Europe</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>South America</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>Middle East</td>
<td>2</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 1. Profile of Respondents

The results determined that the respondents were between the ages of 18 and over 60. The majority of respondents (75%) were aged between 18 and 50 years old. The participants were from several countries live in USA, UK, Netherlands, Sweden, Brazil,
Ecuador, and Saudi Arabia. More than half of the respondents (70%) have a graduate level degree including Master’s, Doctorate, or Professional degree (e.g. JD). The employment categories of the participants range from working full-time to not employed. Sixty percent (60%) of the respondents are employed full-time and only (5%) are employed part-time. Twenty-five (25%) are not working, either retired or seeking employment and only (10%) are currently students. The largest proportion of respondents work in educational services (35%), followed by Information and Professional, scientific or technical services (15%) each, then Health care or social assistance (10%), then Management of companies or enterprises, Manufacturing, Mining, Retail, and Utilities (5%) each.

**Actual M-Payment Use (MU)**

The respondents were asked about their actual use of m-payment. The majority (63%) of the respondents never use m-payment. The closest category was those that use 4-6 times a week and daily at 14.8% each. The most used type of NFC payment is ‘Other’ at 33.33% of respondents which includes non-NFC payments, non-use responses and Ideal, an e-commerce mobile banking app in Netherlands. The second closest at 29.63% of respondents use debit/credit card-based m-payment apps, e.g. AMEX Pay, Visa Pay, and Barclay Pay.

**5.2 Constructs Analysis**

**Scale Reliability Testing**

All variables were created based on a 7-point Likert-type scale. Consequently, Cronbach coefficient alpha was conducted to test the consistency of multiple-item scale. Some researchers consider 0.7 as cut-off value for Cronbach alpha (Hair, et al., 2006), others suggest 0.6 and greater as a satisfactory level (Hair, et al., 2006). However, Alpha value lower than 0.50 are acceptable in exploratory research (Nunnally, 1978).

<table>
<thead>
<tr>
<th>Constructs</th>
<th>No of items</th>
<th>Cronbach Alpha (α) for set</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social World (SW)</td>
<td>4</td>
<td>.9125</td>
</tr>
<tr>
<td>Compatibility (C)</td>
<td>3</td>
<td>.7954</td>
</tr>
<tr>
<td>Perceived Risk (PR)</td>
<td>4</td>
<td>.9042</td>
</tr>
<tr>
<td>Personal Innovativeness (PI)</td>
<td>3</td>
<td>.8885</td>
</tr>
<tr>
<td>Construct</td>
<td>Cronbach’s α</td>
<td>Alpha Score</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Perceived Ease of Use (PEOU)</td>
<td>4</td>
<td>.9643</td>
</tr>
<tr>
<td>Perceived Usefulness (PU)</td>
<td>4</td>
<td>.8502</td>
</tr>
<tr>
<td>Attitude Towards Use (ATT)</td>
<td>4</td>
<td>.8651</td>
</tr>
<tr>
<td>Behavioural Intention to Use (BI)</td>
<td>4</td>
<td>.9307</td>
</tr>
</tbody>
</table>

Table 2. Cronbach's Alpha reliability tests

The Cronbach’s α results in Table 1 indicate a high correlation of the ranked values among every measurement sets used in the survey. The lowest overall Cronbach’s alpha score was for the measurement set of compatibility with a .7954 and the highest alpha score was .9643 for the measurement set of perceived ease of use. The results from the exploratory study confirm the findings found in (Luna, et al., 2018).

Constructs Descriptive Analysis

Since the objective of the exploratory study was to identify factors that may influence the use the m-payment, the participants were asked about specific factors that were found in previous literature. The following sections will summarise the respondents’ opinion about each construct.

Social World (SW)

When asked about the norms in social world, the responses showed that subjective norm has impact on using m-payment with around 65%. This could be due to the absence of experience with mobile technology as the potential adopters are more likely to consult those whom they trust and have experience with the mobile technology.

Compatibility (C)

Compatibility is not considered an issue because the proportion of respondents that specified somewhat agree to strongly agree that m-payment fits with their lifestyle using this technology is consistent with the way they like to buy products and services.

Perceived Risks (PR)

Some respondents see m-payment as a high risk due to the possibility of billing information theft (e.g. credit card number, bank account data) and the abuse of information use (e.g. names of business partners, payment amount). Slightly over half,
52.63%, of the participants disagree that the risk is low, and they are looking for safe financial transaction.

**Personal Innovativeness (PI)**
An individual’s level of innovative behaviour has an impact on technology acceptance. The level of personal innovativeness among the respondents in this exploratory study is moderate; only marginally less than half (46%) were open to use m-payment.

**Perceived Ease of Use (PEOU) and Perceived Usefulness (PU)**
While the majority (70%) of the participants felt it was easy to use m-payment and they could become skilful at using m-payment. Also, 75% of the participants found that using m-payment is useful.

**Attitude Towards Use (ATT)**
The attitude towards m-payment use among the respondents in this exploratory study is moderate with only 55% having a positive attitude towards use of this method of payment.

**Behavioural Intention (BI)**
The result of the survey showed that 75% of the respondents indicated that they would use m-payment if given the opportunity and they are open to using it in the near future.

In summary, the responses have supported the view of this research which was developed based on literature and technology adoption models. However, in order to test the relationship between constructs and validate the research model the survey will be modified to include other aspects of the informal layer not developed thus far.

**6.0 Discussion and Conclusion**
Mobile payments become popular in developed and developing countries. Due to this growth it is expected to see more mobile payments industry to meet the growing demands of consumers. Therefore, this research has proposed a conceptual model for
understanding proximity mobile payment adoption by TAM and OS. The conceptual model (see Figure 3) suggests the eight m-payment adoption factors from the social and technical perspective and twelve hypotheses. A pilot survey was then designed based on the identified factors to explore the current situation of the using m-payment. The survey results are highlighted some additional factors that will be included in the future research. In summary, the preliminary results confirm that it is vital to consider the social and technical factors prior to m-payment adoption. The results confirm the findings in Luna et al (2018)’s work and justify the twelve hypotheses identified in this research.

This research posits theoretical and practical contributions. From the theoretical perspective, this research has addressed the social gap in TAM, identified by Bagozzi (2007) with OS and DoI. OS is a sound social technical approach, and it contributes to study the adoption of m-payment by OCA and OSF. OCA, a norm-based approach helps to understand the individual and societal norms from the informal, formal and technical perspective via OCA. OSF, a sign-based approach where it is also instrumental for studying the features and design of m-payment to its application in the society, which later leads to perception and adoption. OCA and OSF are intertwined, and the analysis is an iterative process. The existing perception and adoption of m-payment will create new signs and norms which later can be considered in enhancing the existing m-payment system. In hindsight, TAM is a hard instrument in studying adoption, and OS is a soft instrument that consolidates the existing factors in TAM and identifying new factors from the norm-based approach. The combination of OS and TAM in returns offers a solid and dynamic method for m-payment providers to response to the rapid changes in a defined market.

Moreover, this research has extended the existing application of OS. OS is generally applied in information system studies. And this research provides a pivotal finding where norms based OCA and sign based OSF are applied in the m-payment. From the empirical perspective, this research provides an instrument for practitioners to measure social and technical factors of m-payment adoption. This research yields a new perspective for practitioners about adoption especially from the impact or effect of using m-payment. The outcome will minimise the design errors or misperception of m-payment.

The research framework is based on literature review and exploratory study. However, the proposed research model illustrates the relationships between OS and TAM. The
limited number of responses is not suitable to conduct a more deep analysis to test the relationships between constructs. Technical and formal factors are not yet identified. The constructs that are identified in the exploratory study will be used for further analysis of using m-payment which could result in deep understanding of accepting this technology by customers. The conceptual model (see Figure 3) will be expanded from the formal and technical perspective. In addition, the relationship among constructs will be examined to determine the importance in each construct and validate the research model by collecting empirical data from consumers.

References


Alalwan, A. A. et al., 2015. Adoption of Mobile Banking in Jordan: Exploring Demographic Differences on Customers’ Perceptions. *I3E*.


Now and Next: A Maturity Framework to Guide Analytics Growth

Abstract

Maturity models concerning the analytics function within organisations cover several characteristics such as data, leadership support, processes, data management, governance, technology and people. Existing models, however, focus on diagnosis rather than guiding future developments, and overlook the importance of IT/Analytics-Business alignment. This paper presents a maturity framework which addresses these two shortcomings and distinguishes between two aspects of maturity – a “state” aspect which is used to access the present situation in the company, and a “management” aspect which analyses existing processes to establish the next stage of the company’s growth in the analytics area. The framework’s utility has been demonstrated through obtaining feedback from a number of managers, who have praised the ability of the framework to integrate diagnosis of the current situation with guidance on the next steps necessary to develop analytics maturity.

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Keywords: Analytics Maturity Models, Alignment, Infrastructure

1.0 Introduction

Numerous maturity models (MMs) have been developed in relation to various aspects of Information Systems (Becker et al., 2009; Mettler and Rohner, 2009). These have been used to evaluate the level of maturity of IT, data warehousing, Business Intelligence (BI), analytics, Big Data, and other emerging areas. From all these different areas, analytics is rapidly gaining recognition for its potential contributions to contemporary organisations, and so this paper focuses on the analytics maturity of organisations.

The concept of analytics is broadly understood as using data to build computer models that can be applied to products, services and processes to achieve a required outcome (Grossman, 2018). The desired outcomes include reduced risk of non-payment or cost, identified new business opportunities, understanding customer preferences, increased sales, employee performance, prospects of a health condition or a political situation etc (Siegel, 2016, pp.160-161). Analytics maturity is in turn defined as the stage of development of an organisation in its pursuit “to integrate, manage, and leverage all relevant internal and external data sources into key decision points” (Halper and Stodder, 2014).
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Existing analytics maturity assessment models are recognised to cover different aspects such as data quality, leadership support, enabling processes including data management and governance, technology, people and skills amongst others. These models, however, focus on diagnosis rather than on guiding the analytics evolution in organisations and overlook the importance of IT/Analytics-Business alignment for achieving high analytics maturity.

This paper addresses these shortcomings by developing a novel maturity model which is influenced by the IT-Business alignment literature. The integrated model distinguishes between two aspects – a current “state” aspect which is used to access the current situation in the organisation, and a “management” aspect which analyses the existing processes and attitudes to establish the likely next stage of the organisation’s growth in the analytics area.

2.0 Related work

2.1 Work in Analytics Maturity Models

The idea of modelling the maturity of an organisation in a specific IT-related area originates from the software process maturity framework developed by the Software Engineering Institute (SEI) in 1987, called Capability Maturity Model (CMM) (Paulk et. al., 1993). The CMM includes a set of recommendations to improve software development and maintenance capability to help the software function within the organisation to refine its software development process by first establishing the current process maturity and then identifying the most critical areas for improvement (Paulk et. al., 1993).

When this idea is applied to analytics, the concept of maturity expands beyond building and deploying analytics models; it is encompassing a range of areas including data and analytics strategy, analytics infrastructure, processes and governance (Grossman, 2018). Data availability and technical skills alone do not guarantee successful data-driven decision-making. Provost and Fawcett (2013) suggest that for a business to achieve benefits, it is a management task to create a data science and analytics culture. However, creating and nurturing an analytics culture can take years (Halper and Stodder, 2014).
Quality of data has been emphasised as an important prerequisite of analytics maturity, however, it remains a major challenge for businesses at all maturity levels (Lismont et al., 2017). This means that relevant mechanisms for ensuring data health and reliability need to be considered as a key factor in any assessment of analytics maturity.

Analytics maturity models (AMM) are known as a tool used to assess a relative position of an organisation in relation to the important characteristics of the maturity. Muller and Hart (2016) indicate that these models are designed to highlight problems that businesses face while implementing Business Intelligence (BI) and Analytics initiatives.

Our review of the existing maturity models in the BI, Analytics and Big Data space indicates that earlier ones were developed in academia with only a handful were being provided by consulting practice. Those models focused on Data Warehousing (Watson et al., 2001; Sen et al., 2012) and BI Maturity (Cates, 2005; Eckerson, 2007; Chuah, 2010). Published in 2007, the first model that addressed analytics was the DELTA model developed by Davenport (2018) and International Institute for Analytics (IIA). Other models originating from the consulting practice emerged in subsequent years, such as Gartner (2010), Capgemini (2012), INFORMS (2013), IBM (2014), TDWI (2014) and IDC (2015), often combining BI and Analytics. An overview of the identified AMMs is shown in Appendix A. Details of each of the identified and reviewed maturity models were analysed to create a set of dimensions in our Analytics Maturity Model.

Lahrmann et al. (2011) provided a theoretical model of maturity that describes five important characteristics of MMs which include the maturity concept, the dimensions, the levels, the maturity principle, and the assessment approach. A brief overview of these characteristics is provided below:

**Maturity Concept:** Lahrmann et. al. (2011) defines three different maturity concepts: “People maturity” shows the degree and availability of knowledge and skills needed to perform required activities; “Process maturity” describes how well specific processes are defined, established, managed, measured and effective; and “Object (or technology) maturity” that characterises the development level of a technology.
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**Dimensions:** These are specific areas of interest. Ideally, each dimension is characterised by several measures such as practices, objects or activities at each maturity level.

**Levels:** Representative states of maturity of each dimension. Each level is identified by a unique descriptor outlining a detailed explanation of its related features.

**Maturity Principle:** Can be of two types, continuous or staged. The continuous type assumes scoring of activities at different levels. Staged MMs assume that all elements of any level are in place before an organisation can progress to the next level.

**Assessment Approach:** Qualitative assessments use descriptions, while quantitative use numeric measures.

Although the existing models can be based on different maturity concepts, dimensions and principles, as described by Lahrmann et al. (2011), they focus on analysis and may provide recommendations on continuous or staged progress in terms of setting goals. However, they do not provide a theoretical foundation for how progress should be achieved.

### 2.2 Research gap

Although some models have been developed by consulting practices and others were proposed by academia, the exact theoretical foundation that describes the basis for the design of the available analytics maturity models is not always provided (Lahrmann et al., 2011). A comprehensive overview of the available models by Muller and Hart (2016) also indicated that the majority of models that originated from the practice had no documentation on their foundations. Despite that many models appear to have been broadly based on the CMM framework, few analytics maturity models originate from the academia. Also, our review shows that the available models appear to use a mixed maturity concept focusing on the three elements as described by Lahrmann (2011), people, process and technology; some also incorporate organisational aspects such as vision, strategy and culture.

**Analytics and maturity gap.** Although, literature discusses analytics processes, data, governance and other relevant characteristics, we have not come across academic
frameworks with a well-rounded interpretation of dimensions that characterise analytics maturity levels as well as suggest a transition method.

**IT/Analytics-Business alignment gap.** Further, although the importance of aligning Business and IT strategy has been covered in the literature extensively, the emergence and adoption of data-driven strategies by companies requires aligning IT/Analytics with the business. Analytics is seen as an element of IT supporting business decision-making and newer research indicates that investments in analytics programmes have been top IT investment priority in recent years (Liberatore et al., 2017), however we found the coverage of IT/Analytics-Business alignment in academic literature inadequate.

**Functional gap.** Because it is typically assumed that technology vendors use modern data technologies naturally, our initial motivation for research originated in exploring available knowledge base related to analytics maturity in technology businesses. We have identified a number of potentially interesting areas. First, there is little discussion of differences in the use of analytics techniques and processes depending on the nature of the business - every software business could potentially work differently with regards to characteristics of products, target customers, sales cycles and type of sales, for example transactional vs relationship selling. More research is needed to understand such practices and challenges. Another important factor to consider is a variety of routes to market. Since, businesses are often segmented in different go-to-markets routes such as direct business, selling through channels and online, investigating how companies can organise their analytics initiatives depending on these aspects could provide additional contributions to existing knowledge.

### 3.0 Developing the Analytics Maturity Framework

Given the lack of integrated models which can both assess the current maturity of an organisation and provide guidance on potential next steps for analytics development in the organisation, we set out to develop our Analytics Maturity Framework (AMF) by synthesising our findings from the literature review and a case study company, using an action design research methodology as described below.
3.1 Overall Approach – Action Design Research

For this research project, we have used the action design research (ADR) method that combines the application of theory with organisational context through gathering feedback from practitioners and users with the aim of solving an organisational challenge by designing and developing an IT artefact (Sein et al., 2011).

The ADR method deals with two challenges: 1) addressing a specific issue within the organisation by intervening and evaluating; and 2) constructing and evaluating of the IT artefact that will address the issue (Sein et al., 2011). The current research has resulted in proposing a framework that can be used to guide companies in their journey to become data-driven organisations.

The adopted research approach is grounded in the ADR method described by Sein et al., (2011) as shown on Figure 1.

![Figure 1. ADR method adapted from Sein et al. (2011)](image)

The use of a single case study in the core of our approach permits an in-depth analysis of needs and context which are sufficiently specific yet typical for a high-tech IT company. This is triangulated with the existing knowledge about such needs provided by the literature to bring about integrated and generalised understanding of the organisational context and user needs. After each version of the artefact had been developed, we evaluated it by again drawing on both practical interviews and on theory comparison. Details are provided below.
3.2 Research Process

To explore the research question, the team used two qualitative methods concurrently, literature review and interviews. Both represent the primary input into our evaluation of the existing maturity models, their applicability to the case study company and its assessment; and their synthesis in a single model.

To guide our research progress, the following sequence of the research process phases was adapted from Sein et al. (2011) as described below:

**Problem Definition:** A current business problem was formulated by the practitioners from the case study company that was preparing to commence a major CRM system change. As part of this change, the company was looking at ways to build a company-wide automated sales forecasting process in order to have global upwards visibility and be a more predictive business. A business unit in question was facing challenges with streamlining the sales forecasting processes across different regions and had issues with accuracy of forecasts. This was due to internal complexities related to departmental and regional differences such as inaccurate implementation of information systems that capture data; lack of information systems adoption by employees; use of different forecasting methods by different regions; lack of predictive analytics processes; inaccuracy of input data; and the absence of global business alignment. This research proposed to assess the company’s level of development in terms of incorporating analytics and transforming this key process, so that the unified forecasting techniques could be adopted by different teams, aligned globally and implemented within the chosen CRM.

Both theory- and practice-inspired research was used here. Key information about the issue was gathered on: a) the existing process of forecasting sales and financial performance; and b) understanding of the existing practices and challenges from a practical standpoint with the case study organisation as well as literature research on the issue. During this phase, more precise business requirements were defined by the company management. These requirements were expanded on the problem definition to include improvement of forecast accuracy, better transparency and understanding of the sales forecasting process and its output; use of data and suitable analytics techniques by the business unit; reduced time for producing sales forecasts; increased
sales. All these aspects were incorporated in the design of a questionnaire which we used to gather case study input during the next stage.

The **Building, Intervention and Evaluation (BIE)** stage included activities required to meet the research objectives: 1) carrying out interviews with the practitioners and users. Interview questions focused on gathering information relevant to the existing sales forecasting process and the associated practices and challenges, as well as understanding of the company’s maturity level and potential improvements; 2) reviewing available maturity models by the ADR team - the researchers; and 3) integrating elements of maturity models into the target artefact.

The interviews with the practitioners, or strategic users such as global programme director and business process manager, gave insights into the circumstances of the company, established the importance of the alignment between IT and business processes, and the quality of information available to analytics systems. This additional evidence contributed to the shaping of the artefact in the iterative process.

The primary source for building the new artefact was guided by organisational interventions and therefore this stage was primarily ‘organisation-dominant BIE’ (Sein et al., 2011). This motivated the use of the five maturity levels of Luftman and Kempaiah’s Strategic Alignment Maturity (SAM) model (2007) and adapting their definitions: ‘Initial’, ‘Committed’, ‘Focused’, ‘Managed’ and ‘Optimised’ for the final artefact.

The synthesised model also draws on CMM’s (Paulk et. al, 1993) generic description of each level’s characteristics. However, we apply those characteristics specifically to the use of analytics, rather than the software development process as in the original CMM model. This is to create a synthesised definition of maturity levels instead of using individual definitions and labels provided by the evaluated AMMs.

**Reflection, Learning and Formalisation of Learning** are the final phases of the process, which involved validating the research project output (artefact) with the users and practitioners by presenting the model to the case study company as well as cross-checking the related research literature and formulating theoretical implications. The artefact needed to address two points: 1) it reflected preliminary designs from the researchers’ theoretical perspective; and 2) it had to provide a solution to an organisational challenge from a practical perspective.
The refinement and reassessment of the research aim and objectives as part of and throughout the research process has reflected the iterative nature of the ADR process and principles.

### 3.3 Synthesising the framework

In this section we describe the process of synthesising the framework in further detail. Individual features of the available AMMs were used to construct representative characteristics of each of the model’s maturity levels. To adhere to Lahrmann’s theoretical model of maturity that implies the existence of maturity dimensions, we further developed the integrated maturity levels by devising unified dimensions, as depicted in Figure 2. In the figure we have listed three of the most recent and analytics-focused maturity models: INFORMS (Burciaga, 2013); IDC (Vesse et al., 2015) and TDWI (Halper and Stodder, 2014), yet other reviewed models from Appendix A also informed our synthesis.

![Integrating Maturity Level Characteristics](image)

**Figure 2.** Integrating Maturity Level Characteristics; input maturity models are defined in Appendix A.

To do so, we adapted the IT/Analytics-Business Alignment Maturity Criteria from the SAM model (Luftman, 2000, 2007). Although the original criteria describe strategic alignment between IT and Business, our adapted version, which is outlined further, focuses primarily on IT/Analytics-Business Alignment whereby Analytics is a function of IT.

We highlight three reasons for the adaptation of the SAM model for standardised measures (criteria) of Maturity Levels and Dimensions in our research model. First, it emphasises the ‘use of analytics’ for solving business problems. Second, since the theoretical basis for the reviewed AMMs was not provided by the models, this
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approach offered the underpinning foundation and consistency. Finally, although the three selected models agreed on certain elements as part of maturity characteristics, using multiple dimensions from the individual models presented difficulties in characterising integrated maturity levels.

Having defined the similarity to Luftman’s SAM model, grouping or clustering of dimensions was based on commonly occurred themes for each maturity level of the integrated model. Furthermore, six criteria indicating IT/Analytics – Business Alignment maturity were selected based on the premise that while each criterion is important, alone it is insufficient; alignment will be achieved when all the elements are in place, nurtured, monitored and revised. The process of creating IT/Analytics – Business Alignment Criteria is shown in Figure 3.

![Figure 3. Creating Alignment Dimensions Process](image)

The need to create standardised dimensions was also supported by findings from the interviews. IT/Analytics – Business alignment, capability and maturity came up as some of the current challenges within the case study company in our interview findings. For example, IT systems were not ready to accommodate the concerned business unit’s forecasting process across all regions which represented a challenge for the relevant staff. While the use of predictive modelling was desired by the functional business units, the state of the IT infrastructure did not allow for such integration, indicating IT/Analytics-Business misalignment. Also, the availability of analytics resources existed within individual business units; analytics processes were not established in some regions, while other regions utilised both, skills and processes on the departmental level.

Following the ADR process and principles, we looked at ways of incorporating these findings and feedback from the practitioners and users into our research model; and
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then feeding the organisational contextual information into the analysis in order to refine the development of the framework (artefact).

As a result, creating well-defined synthesised Maturity Levels and their criteria describing the characteristics of each stage of maturity aided us in generating our recommendations to the company.

4.0 Details of the Analytics Maturity Framework

4.1 IT/Analytics – Business Alignment and Maturity Dimensions

Our ‘IT/Analytics-Business Alignment’ model is adapted from Luftman and Kempaiah (2007) and consists of six dimensions that are indicative of the IT/Analytics – Business alignment as described below:

**Organisation:** Defines to what extent the organisational strategy, culture, leadership, skills and funding backs analytics initiatives. Demonstrates the support of Information Technology, Information Systems and Analytics to the business as well as it reflects the awareness of the benefits of the use of analytics across the organisation (fragmented, Business Unite-level or widespread). Is Analytics used in everyday decision making?

**IT & Analytics Infrastructure:** Defines the level of suitability of the infrastructure and platform/architecture development in support of analytics programmes. Demonstrates the ability of the infrastructure to support large volumes of data and integrate additional data for all relevant business operations and users.

**Analytics Processes:** Demonstrates how extensive data characteristics (variety, velocity, timeliness, quality) used in analytics are. Defines the existence of data and analytics processes and how the organisation manages them.

**Skills:** Demonstrates what level of data and analytics skills exist in the organisation to work with current and future technologies. Assesses necessary practices such as acquisition, retention, training, skills development, etc. as well as capability for learning.
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**Governance:** Defines who has an authority to make decisions related to governance of analytics. Demonstrates how coherent and supportive of analytics programmes the company’s data governance strategy is.

**Data & Analytics Technologies:** Demonstrates how advanced the organisation is in the use of analytics technologies, tools and techniques. How analytics are used and delivered. Attitude of the organisation to analytics process management and metrics, how standardised the analytics processes are and how they are integrated with key business processes and decisions.

### 4.2 Five Levels of Analytics Maturity

Maturity levels of the integrated AMF and their description in terms of the six dimensions adapted from the SAM framework are presented in Section 5.0.

The framework consists of the following components:

1. Five Analytics Maturity Levels;
2. Six IT/Analytics – Business Strategic Alignment dimensions that characterise each maturity level. Each dimension was further evaluated with the following aspects:

   **A: Management.** This characterises the existing processes and the considerations the business makes regarding analytics within the context of each maturity level;

   **B: State.** Qualitative assessment of what the business currently uses and what capabilities it has (e.g. infrastructure, technology, skills, processes);

3. Transition to the next maturity level.

### 5.0 Using the framework to guide analytics growth

**5.1 Role of both aspects in the framework**

The framework distinguishes between two aspects of analytics maturity at each level – a present “State” aspect which is used to access the current situation in the organisation, and a “Management” aspect which analyses existing processes and attitudes to establishing the next stage of the organisation’s growth in the analytics
area. The presence of these two aspects makes our proposed framework unique among those reviewed and allows us to use it for both analysing the existing situation and for guiding the transition towards the higher levels of maturity. The visualisation of the framework and the aspect of the analytics growth are provided in Figure 4. Full details are available at https://bit.ly/2GogTmn
**Figure 4. Maturity Levels’ Dimensions and Characteristics in the Proposed Analytics Maturity Framework, including Aspects of Maturity**

<table>
<thead>
<tr>
<th>Dimensions-and-Aspects-of-Maturity:</th>
<th>Initial</th>
<th>Committed</th>
<th>Focused</th>
<th>Managed</th>
<th>Optimised</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Organisation:</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>B-Business-questions—what-is-the-current-business-problem-that-needs-to-be-addressed-with-Analytics?</td>
<td>Enterprise architecture does not support analytics, only business functions</td>
<td>Consider IT support for selected business issues with Analytics</td>
<td>Attempts to unify architecture, considering available technologies e.g. cloud or Hadoop</td>
<td>The infrastructure is united to underpin analytics, analytics ecosystem</td>
<td>Coherent, fully operational Analytics infrastructure is used in the mission-critical aspects of the business</td>
</tr>
<tr>
<td><strong>IT&amp;A-Infrastructure:</strong></td>
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<tr>
<td>A-Attitude-to-dedicated-infrastructure—</td>
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<tr>
<td>B-Volumes that can be handled by the existing infrastructure, platform, development—</td>
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<tr>
<td><strong>Analytics-Processes:</strong></td>
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<tr>
<td>A-Processes-managed—</td>
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</tr>
<tr>
<td>B-Data-characteristics—(variety, velocity, timeliness, quality)—</td>
<td>processes are siloed, not focused on data &amp; analytics</td>
<td>No formal processes; no pro-active data collection for Analytics initiatives</td>
<td>Initial attempts to monitor progress and document processes and outcomes</td>
<td>Analytics processes are automated and integrated with other business processes</td>
<td>Standardised processes are established, integrated with all key business processes &amp; decisions</td>
</tr>
<tr>
<td><strong>Skills:</strong></td>
<td></td>
<td></td>
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<tr>
<td>A-Processes-and-attitudes-to-future-analytics-skills—</td>
<td></td>
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<tr>
<td>B-Current-skills-level—(skills—Beginner, Intermediate, Advanced)—</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Governance:</strong></td>
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<tr>
<td>A-Data-Governance-processes—</td>
<td></td>
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<tr>
<td>B-Granularity &amp; Source—(level-of-data-granularity, data-source)—</td>
<td></td>
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<tr>
<td><strong>Data-&amp;-Analytics-Technologies:</strong></td>
<td></td>
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</tr>
<tr>
<td>A-The-technologies-they-are-used—</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-Current-availability—(what-technologies-are-currently-used)—</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Use of technologies by BU to address a specific function, skill

New technology can be acquired and used for a specific project

Range of technologies, variety of platforms support Analytics programmes

Centralised approach to select methods, software, and hardware for various problems
5.2 Moving through stages of the analytics maturity using the framework

The transition model can be applied to any Dimension/Maturity Level in the framework. It is used to guide the organisation’s progress from any current level of maturity to more advanced.

The transition begins from the present state $B_t$ as assessed by the “State” aspect of a specific maturity dimension. If a higher maturity state $B_{t+1}$ is desired, the organisation should initiate the transition by changing its current assessment $A_t$ according to the “Management” aspect of the same dimension to the one associated with the desired higher level of maturity $A_{t+1}$. This transition is represented by the arched arrow inside the diagram in Figure 5. The underlying assumption is that the current analytics maturity level is a result of the current practices and attitudes measured by the “Management” aspect, as represented by the vertical arrow on the right of Figure 5.

The change, for example, should centre around embracing relevant analytics and governance strategy, or hiring strategies, etc. As the sophistication of infrastructure, technology and techniques grows, and the implementation of the analytics strategy, governance and processes support the business requirements, the desired “future” state $B_{t+1}$ and management maturity assessment become a reality; this will be now considered as “present” state and management maturity, which is shown by the backward arrow on the outside of the diagram. The previously-defined aspirations are achieved and so to progress towards creating a new “future” state of analytics maturity, the “management maturity” should change again. This is a continuous spiral-like cycle.

![Transition model](image)
6.0 **Assessing the framework and its advisory component**

6.1 **Approach for gathering feedback**

To gather feedback on the framework we presented our findings and the maturity model to senior managers within the case study company. In addition, this framework was also shown to three Operations, Process and IT Managers within external companies to obtain their opinion about the usefulness and relevancy. One company is an early-stage start-up with no global footprint and another is slightly more mature with the global footprint.

All managers were surveyed after the presentation delivered over a series of conference calls and face to face discussions. The presentations focused on explaining what the framework is, why it has been created and how this could support their business. This was followed by a set of questions to the participants to understand how their businesses could use this framework.

6.2 **Feedback summary**

When asked whether the framework was useful five interviewees across three companies agreed this was very useful for reasons such as gaining an understanding of the current state of their business. More importantly, they were able to understand what the desired state should be and start building initiatives in their roadmaps to achieve a desired level, and bring in the right people for projects. The respondents found the framework clear as they were able to identify what analytics maturity level their business was at. When asked whether it could help them select the right analytics technique, the general response was positive since it worked at a high level; however, it was indicated that there was a need to incorporate other elements such as the nature of the business and the data collected. Also, when asked whether the framework provided guidance on how to move to a certain maturity level, some respondents said it only provided them with identifiable maturity characteristics at each level, but not with ‘this is what you need to do’ help to move to the next levels. Overall, all respondents found it practical and would use this framework in their business.
7.0 Conclusion and Summary

7.1 Summary

Our approach to this research question of how a business process can be transformed from intuition-led into data-driven and what maturity development strategy organisations can use has been based on the principles of the Action Design Research method. We have used an extensive knowledge base of available methods, frameworks and models. We explored available analytics maturity models and evaluated them from the perspective of the theoretical model of maturity. To be able to apply the existing knowledge to the real business problem and build a solution suitable for the organisational context, we investigated company challenges through interviews with key knowledge holders from within the case study company. We also learned that IT systems used across different regions did not accommodate the needs of the forecasting process for the business unit in question. In addition, while there was awareness of how analytics could be leveraged across the business, the lack of well-established analytics strategy, clearly-defined analytics processes and governance was the barrier to a wider use of analytics in sales forecasting, and potentially in other processes. Having completed the analytics maturity assessments, we synthesised the characteristics of maturity levels from three maturity models to generate an integrated model. We derived five analytics maturity levels from our synthesis and this new framework is based on the principles of the IT-Business Strategic Alignment Maturity. The six criteria, called Dimensions, that characterise each Maturity Level in this framework have been designed by grouping commonly occurred themes and while they were adapted from Luftman’s SAM model (2000, 2007), the primary focus of the alignment is the analytics space. Although, businesses will always want to know what happened and how they perform over a period of time, data-driven decision making incorporating predictive and prescriptive modelling is becoming more pervasive. This creates new challenges: data quality, unification and governance are becoming primary issues that need to be addressed by the management. Furthermore, the attitude towards the present state of the analytics strategy, infrastructure, skills, analytics processes and governance directly affect the choice of analytics techniques. The observation is that the more mature companies can apply a wider range of analytics technologies and techniques to address a broader pool of business questions and opportunities. These techniques are machine learning
Now and Next: A Maturity Framework to Guide Analytics Growth

algorithms, and while in some cases they may underperform traditional statistical techniques (Makridakis et al., 2018), they are more capable of dealing with the ever-growing data volume and scale. Our framework provides a way of positioning the business in relation to the maturity level and assessing the IT/Analytics-Business Alignment. It further proposes a transition move to a desired state, to achieve analytics maturity growth. It has been validated with Senior Managers from the case study company and external companies through discussions of usefulness of the framework, the challenging areas and whether the business can be correctly positioned within the analytics maturity levels. It was agreed that the issues identified with the use of the proposed framework required closer attention by the management.

7.2 Limitations and further work

While applying the proposed framework on the cases study company was the primary purpose of this research project, we acknowledge that drawing on only one case study with some limited external validation provides insufficient basis to claim general applicability. Therefore, we recognise that further development and refinement is needed and there might be additional opportunities to extend this work. In a similar fashion, further potential exists in investigating the suitability of IT infrastructure and architecture to the maturity levels. Many companies run on legacy IT infrastructure and systems which might not be suitable for the modern data-driven business environment. In the future research, an in-depth investigation of other dimensions, for example analytics processes or governance, represents a potential opportunity since even the organisations at the highest maturity levels experience challenges with standardisation. We also recognise feedback from the validation exercise, that the transition move should be clearly explained in order to achieve desired maturity growth, especially given that this framework presumes a continuous maturity principle.

7.3 Contributions

The outcome of this research presents a number of important implications, both theoretical and practical. In the theoretical domain, this research covers the identified literature gaps relating to the absence of comprehensive analytics maturity
Now and Next: A Maturity Framework to Guide Analytics Growth

frameworks from the academia in recent years. The proposed framework provides a theoretical foundation for characteristics that describe maturity. It also suggests a transition method that takes into account the present state and organisational attitude towards the use of analytics; and also the future state of a desired maturity level. The research addresses the IT/Analytics-Business alignment, whereby Analytics is an important IT element, illustrated through the six dimensions which should be mutually inclusive to achieve the business strategy, IT and Analytics alignment for a data-driven business. Although we have not fully covered the functional gap to address the nature of the business (e.g. transactional volume, or large but infrequent deals) as an important element defining the right analytics processes, this is a potential topic that can be further investigated.

In the practical or managerial domain, the framework provides a qualitative assessment tool for business managers helping to understand their organisation’s stage of development in relation to implementing analytics for decision making as part of a data-driven transformation. Business leaders could use this framework to plan actions and set goals. For example:

**Short term goals:** to form an understanding of their current environment and maturity level so that they can build the right analytics processes, environment, governance and select suitable data technologies and analytics techniques;

**Long term goals:** to form an understanding of current state as well as a desired analytics maturity state and design a move to the next level.

We believe this framework provides a comprehensive approach to identifying the analytics maturity level and dimensions that need to be addressed so business could achieve their analytics growth.
Now and Next: A Maturity Framework to Guide Analytics Growth

References


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## Appendix A. Maturity Models Overview

<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>Reference</th>
<th>Addressed topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>INFORMS</td>
<td>Burciga, 2013</td>
<td>Organisational practices and culture; analytics capability, data &amp; infrastructure. This is analytics-focused model</td>
</tr>
<tr>
<td>2</td>
<td>IDC</td>
<td>Vesset et al., 2015</td>
<td>Maturity concept focuses on people, processes and technology across five dimensions: vision, technology, data, people, process</td>
</tr>
<tr>
<td>3</td>
<td>TDWI</td>
<td>Halper F. and Stodder, D., 2014</td>
<td>TDWI (The Data Warehousing Institute) Analytics maturity measures the ability of businesses to expand their analytics capabilities in terms of technologies, data management, analytics, governance, and organisational aspects</td>
</tr>
<tr>
<td>4</td>
<td>PAFMA</td>
<td>Capgemini, 2012</td>
<td>Predictive Analytics Maturity Framework Assessment (PAMFA) examines maturity in terms of technology environment and the organisation's ability to adopt analytics. The model looks at the adequacy of people, processes, deployment, prioritisation and governance for analytics purposes</td>
</tr>
<tr>
<td>5</td>
<td>Gartner</td>
<td>Howson, C. and Duncan, D., 2015</td>
<td>The Gartner model identifies the level of development BI and analytics initiative must reach in order to support enterprise goals</td>
</tr>
<tr>
<td>6</td>
<td>IIA AIMA</td>
<td>IIA, no date</td>
<td>The Analytics Maturity Assessment (AMA) is based on DELTA model (2007). It measures how well an organisation uses analytics to increase revenue, reduce costs, optimise performance and improve overall decision-making. The main concept is on business issues such as analytics strategy, non-data driven corporate cultures, poor processes, organisational resistance, quality and availability of data. The updated model (2017) includes two new components: technology &amp; analytics techniques</td>
</tr>
<tr>
<td>7</td>
<td>APMM</td>
<td>Grossman, R., 2018</td>
<td>The Analytic Processes Maturity Model (APMM) identifies analytics-related processes in six key process areas: i) building analytic models; ii) deploying analytic models; iii) managing and operating analytic infrastructure; iv) protecting analytic assets through appropriate policies; v) operating an analytic governance structure; and vi) identifying analytic opportunities, making decisions and allocating resources based on an analytic strategy</td>
</tr>
<tr>
<td>8</td>
<td>EBIMM</td>
<td>Chuah, M-H., 2010</td>
<td>The Enterprise Business Intelligence Maturity Model (EBIMM) model offers a set of dimensions comprising of data warehousing, information quality, knowledge process to evaluate the maturity levels of Enterprise Business Intelligence. The model is based on the CMM framework</td>
</tr>
<tr>
<td>9</td>
<td>DWPM</td>
<td>Sen et al., 2012</td>
<td>The Data Warehousing Process Maturity (DWPM) model uses the CMM principle for a continuously evolving data warehousing process in an organisation supporting quality and timely delivery of information</td>
</tr>
<tr>
<td>10</td>
<td>LOBI</td>
<td>Cates et al., 2005</td>
<td>Ladder of Business Intelligence (LOBI) is a framework for enterprise IT planning and architecture</td>
</tr>
<tr>
<td>11</td>
<td>IBM</td>
<td>Nott, C., 2014</td>
<td>IBM Big Data &amp; Analytics Maturity Model focuses on business strategy, information, analytics, culture, architecture, governance</td>
</tr>
<tr>
<td>12</td>
<td>'Stage growth' model</td>
<td>Watson et al., 2001</td>
<td>The model uses the 'stages of growth' concept widely used in organisational and IS research. It is based on the premise that things change over time, in both sequential and predictable ways</td>
</tr>
</tbody>
</table>
THE PURPOSE OF AN INFORMATION SYSTEM: REFLECTIONS ON A CUSTOMER RELATIONSHIP MANAGEMENT SYSTEM CASE STUDY

Abstract

The paper critiques a case study of the use of a customer relationship management system in a telecommunication company. Based on published quotations from the field study, some core concepts concerning the behaviour of information systems in organisations are developed. Discussion of the CRM implementation leads to the proposal of a definition of an information system as: An information system mediates a relationship towards an agreed outcome or purpose; To do this objects-of-interest are manipulated through processes, Conforming to a negotiated interpretation of the real world. Analysis of the case study leads to the identification of 38 concepts and the definition of a set of core concepts: purpose, objectification, legitimisation, selection-exclusion, primacy of the model and behaviour change. The gap between the information systems model and the reality of the organisation is discussed.

Keywords: Customer relationship management system, model and reality, information system purpose, information system definition.

1. INTRODUCTION

An information systems field study can generate an immense amount of data: interview transcripts, field notes, observations, meeting minutes and a wide range of documentation, providing a rich source of insights and commentary on the nature and effects of information systems in organisations. However, the danger is that. In seeking to demonstrate rigorous
analytical methodology we overlook rich and varied insights that the data offers and are satisfied with the direction that the analysis tools lead us in. The application of a more reflective approach, in which we bring our experience to bear on the data may mine unexpected riches from the data which we might have overlooked if we remained to detached from the data, if we expected the data to speak for itself, rather than considering the process of interpretation as one involving a dialogue between the data and the researcher.

It may be that we are too demanding of the data, that we expect it to speak for itself without the researcher’s influence, that we expect the emergence of laws and theories which are in a sense out there, and stand independent of the interpretation and perceptions of the researcher. Such pursuance of objectivity may mean that we alight on a small fraction of the problem space, that we sink into one attractor and are unaware of the vastness of the landscape from which lessons may be drawn.

A particular paper in the Information Systems Journal caught my eye because it described a complex relationship between an information system, in this case a customer relationship management system, the organisation it inhabited and the relationships it mediated. Furthermore, the authors’ conclusion, concerning the concepts of loose and tight coupling, not only did not resonate with my industrial experience but also, I felt, did not do justice to the extent and richness of the field work. In presenting its case, the paper provided a wide range of key quotes from the fieldwork which, by my reading, suggested there was much more to this case than met the eye.

So I set about analysing each quote, breaking it down to identify what I felt were important concepts and key issues. From this, applying the same approach as the authors, I identified a series of concepts which led me to reflect on the definition of an information system, that is the underlying computer systems, the processes and data models and its day-to-day operational use.

In this paper I discuss that exercise, providing the analysis tables and conclude by attempting to define what and information system is based on my reflections on this case study.

In their 2015 study, Cunha et al (2015) explore the dark side of computer-mediated control through a case study of the use of a CRM in a large European communications company. A customer relationship management system was introduced to a new desk sales workgroup and some eighty staff were mandated to use the system by the managers. The system became the basis for recording sales and hence determining sales personnel’s bonuses. For senior managers the CRM was an instrument for judging the success of the sales desk and
evaluating its viability. For sales managers it became an instrument for control, for eliciting a competitive spirit and chiding poor sales performance by individuals. For the sales employee it became a driver of ambition and a quantifier of performance. Cunha et al’s study, conducted over a period of 15 months, involved 307 days of observation, 104 interviews, observation of 51 team meetings and analysis of 120 monthly team reports and 15 monthly unit reports. In all more than 3000 pages of documentation was collected. Cunha et al’s theoretical interpretation of their field research addressed the alignment between the information system and the practice. They posit a dichotomy between tight coupling and loose coupling. Tight coupling occurs when the information system records every action of the employee in some automated way. Loosely coupled systems only hold the records of work that the employee enters. Their conclusion is that information systems design should be based on what employees actually do, rather than what the organisation expects them to do. This seems to me weak conclusion, and possibly un-implementable.

2. THE CONCEPT OF LOOSE AND TIGHT COUPLING

Cunha et al draw on a range of theoretical frameworks including Foucault’s Panopticon and Gidden’s structuration theory, pausing at Zuboff’s concept of informating on the way. Structuration theory is used to support the coding, particularly the third stage of coding, and the Foucauldian concept of the panopticon is discussed because of its prevalence in the analysis of CMCs. However, Cunha et al use two principle concepts to drive the study. Firstly, there is the concept of the dark side of computer-mediated control. Secondly, there is the concept of loose and tight coupling, which shapes the analysis and the aggregation of the categories derived in the analysis. In this paper I focus on the loose and tight coupling concept.

Primarily, Cunha et al’s theoretical interpretation of their field research addresses the alignment between the information system and the practice. They posit a dichotomy between tight coupling and loose coupling. Tightly coupled systems imply an automation where the employee becomes an object to be monitored and recorded: ‘exhaustive and detailed data about employee’s work practices and their achievements are produced automatically by technology without any human intervention.’ (p321, italics mine).

Wherever the interface is between the information system and the human, the moment the two connect there is human intervention and interpretation. The human cannot be eliminated
from the loop, even in the most automated system. A CRM might automatically record the basic data concerning any call made by a desk sales employee. It could also record the conversation and transcribe it into text recorded in a database. But what type of call it was – whether a service call, checking up whether the customer has received a product, initiating a sale, closing a sale – this requires human intervention and judgement. Rather than Cunha et al’s conclusion that tight coupling of information system to work practice will avoid the ‘dark side of CMC’, the focus should be moved to the purpose and meaning of the IS, or the telos of the IS. A concentration on the practice rather than purpose is rather like a focussing on the apple falling rather than the force of gravity motivating the apple’s descent. Developing a narrative around the design and implementation of support practices ‘misdirects our attention to the apple of the digital, when the real forces that determine the apple’s path are hidden from view.” Zuboff (2015). Even if people’s actual work practices match those which are prescribed by their company and monitored by the information system, a misalignment of, or a lack of reconciliation of the goals, purposes and internal goods pursued by various stakeholder populations will still encourage disruption and manipulation of the information system and its processes and outputs. If the information system, that is the representation, is more closely aligned with the real world purposeful activity, it follows that the playing of the game and the temptation to manipulate the world to fit the representation will be less. In that sense, tight coupling will be a good thing, because it more closely ties the actor purposes and targets driven by the information system with the intentions of the real world purposeful activity. However, the purposeful activity system is located in practice. Its telos and purpose may well conflict with the telos and the purpose of the institution. Hence the managerial purpose of the information system is to drive the activity towards institutional goals of external goods such as profit targets and suppress much harder to measureable internal goods such as excellence in service (MacIntyre 2007).

A better way would be to engage the information system as an instrument of mediation between the institution and the practice in understanding and agreeing purpose and meaning. The benefit of tight coupling would lie in the tying together purpose and meaning rather than the improvement of the representation of the real-world activity. In reading Cunha et al’s case study we have to ask: tight coupling to what?
3. RESEARCH PROCEDURES

Cunha does not tell us anything about entry to the field or the nature of the relationship between the researcher and the participants. Beyond the theoretical framework we are told nothing about the experience of the researcher or the role or positioning of the researcher in the organisation. The researcher is presented as a faceless observer, merely entering the field, almost invisibly and gathering evidence and documentation, rather like a drone flying over or a remote camera. Not only will the researcher’s mere presence over 307 days of observations affect the atmosphere, but the researcher will become a part of the world of the CMC. Participant observation is a way of knowing from the inside (Ingold, 2013, p5). The researcher in a human environment is not the equivalent of the zoologist sitting in a hide in the dark of the night waiting for the panther to stride by within arm’s reach and yet unaware of the zoologist’s presence. The zoologist is aware that even the slightest perception of her presence by the panther would completely change the situation. And what is the case for a cat must be much more the case for humans. Furthermore, unlike the zoologist in her hide, the researcher in an interview is part of a dialogue. The interviewee observes and socially connects in some way with the interviewer. Based on perception of power and distance, based on prior relationship and knowledge, an interaction is set up. The interview is furnished by physical environment, by prior knowledge and understanding, and by culture. It is not the static observation of a stone by a camera. The interview is also endowed with growth and emotion. Both the interviewer and the interviewee come out changed. The interviewee, by merely describing her current situation enters into self-reflection and will also take cues, look for feedback and confirmation from the interviewer. The researcher enters into a world that is continually on the boil, not a giant museum of stuffed objects (Ingold, 2010). As we question through interviews, or extract documents from meetings, the text, is torn away from the person and leaves behind an entire landscape of narratives, experience, networked engagement and embedding in the situation. Our questioning, far from producing real insights have impoverished and created distance. What we have torn away leaves behind the whole picture. Cunha et al employ three stages of coding, firstly deriving categories from codes explicitly identified in the data. This data includes documentation such as target lists, job descriptions,
procedures and manuals, interviews, follow-up questions and so on. The implication is that these categories are there in the data, objectively identifiable. But of course, some selection and interpretation by the researcher is inevitable. The second stage of coding aggregates categories from the first stage and summarizes them in eight higher level categories. Like the output of the first stage of coding, the categories identified are purely descriptive. The exercise is one of condensing, précising, abstracting the description. In the third stage of coding a jump occurs in which the concept of coupling appears. This is clearly a subjective and interpretive step. But the mechanism of coding offers a disguise of objectivity, a suggestion that the concept of coupling has in some way naturally emerged from the data and was there in the first place. The problem here is that the rich information and conceptual space that the case study offer has been abandoned as the researchers converge on one spot. We have become trapped in a hole, a single point in a vast and rich problem space and ignore a variety of other phenomena, concepts and ideas.

4. INTERPRETIVE APPROACH

My first step was to go through every quote in the paper, considering it carefully and highlighting every comment or phrase that I felt revealed something significant in the role and outcomes of the deployment of the CRM. This was done as a desk exercise, support by copious cups of coffee. This was done by hand, without supporting software. The use of the software to ‘code’ the data may results in either overlooking key ideas or being so swamped by data that the important jewels are obscured by a sea of stones.

Of course, by limiting myself to the published quotes, I recognise that the hard work of condensing 3000 pages of documentation has been done by the authors and I am in a privileged position. However, I attempted to parallel the approach of the authors in moving from a general listing of concepts (see Appendix) to a set of key concepts. In developing the general concepts, I identified the concept, pasted in the published quotes and recorded commentary in a manner which you might record reflections as part of a grounded theory exercise.
<table>
<thead>
<tr>
<th>Purpose</th>
<th>The perceived goal or telos of the system of which there may be multiple, conflicting purposes depending on the stakeholder group concerned.</th>
<th>Perceived purpose of the system Data as justification Bounded information access Information system determining purpose Conceptualising purpose Information system encourages alignment of bottom individual and institutional purpose Information system impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objectification</td>
<td>The transformation through the information system of an individual, group or artefact into an object of interest defined by the coded measurable.</td>
<td>Stakeholder as capital object</td>
</tr>
<tr>
<td>Legitimisation</td>
<td>Appeal to the information system and its characteristics as a basis for the justification of purpose and the control of behaviour.</td>
<td>Control perceived as result of volume and completeness of data captured. Rhetoric of transparency Rhetoric of accuracy Management of consistency Legitimisation of management expectations by data visualisation</td>
</tr>
<tr>
<td>Selection and exclusion</td>
<td>The selection of specific information fields in order to enforce conformity to the perceived purpose and define the boundaries of behaviour.</td>
<td>Defining relevancy Activity exclusion</td>
</tr>
<tr>
<td>Primacy of the Model</td>
<td>The information model and its implementation take priority over the real world and becomes the main focus of both telos and behaviour.</td>
<td>Shift of purpose results in shift of purposeful activity. Setting the agenda Productivity illusion Information system as proxy manager Information system as game representation</td>
</tr>
<tr>
<td>Behaviour</td>
<td>Behaviour is changed in response to the primacy of the model.</td>
<td>Erosion of trust Quantitative enforcing Right queries Information system determining purpose Information systems as an instrument of self-monitoring Gamification of purposeful activity Information systems as</td>
</tr>
</tbody>
</table>
From this exercise I identified 38 new themes (See Appendix 1). These were connected and developed into a web of meaning (Figure 1). Within this network, I created nodes of reflections and settled on 7 major concepts (Table 1).

But it should be noted that there is no attempt to suggest that my conclusions are in some way dictated by the data. The theories and concepts cannot be said to somehow pre-exist in the data, simply waiting to be dug out, like an archaeologist might dig a pot up. Rather it is the data, the participant quotes, which are dug up like a pot. The interpretation depends on the knowledge and training of the archaeologist or indeed the information systems researcher. Such concepts, ideas and theories are products of human creativity.

5. APPLICATION TO CASE STUDY

Cunha et al’s study is metaphorically a creation of a grave for the preservation of artefacts for some expected afterlife. There is no living conversation. And as a research commentator, with only the final publication to work with it is as if the grave has been robbed: we are left with some fragments which suggest a once living environment. We can only infer and imagine the richness and complexity of the environment from our interpretation of the few remaining artefacts.
The identification of concepts such as purpose and accuracy expose a complex role for the CMC involving power and meaning. My view of the case study is expressed in the created web of meaning which attempts to link ideas from across the quotes. The web of meaning is an attempt to portray the complex living dynamics of an information system in situ. It is in a sense of work of art: an artefact which draws out the role of the information system, not as some mechanical recorder of material information, but as mediator of the human relationships which drive an organisation. The web of meaning is an interpretation of an interpretation. The excavated artefacts of quotes point to a living organism, a network of human relationships within which meaning and purpose is negotiated.
6. THE THEORETICAL TURN: WHAT IS AN INFORMATION SYSTEM?

Alter (2016) defines a theory as an abstract account. Theory generalises. It may offer description, definition and explanation. The theory provides a lens through which to view a practical phenomenon. Its value lies in how it develops, alters, realigns the thinking of researchers and practitioners involved with the information system phenomena. A theory is an interpretation of a phenomena, an expression of human understanding, located in time and culture. It is not something that is out there, rather it is in us. It is an abstraction from complexity to create a simplicity sufficient for us to navigate through our world and make enough sense of it to survive.

Here I raise a descriptive theory which revisits debate on what an information system is. I would suggest that the critical aspect of an information system is not the data it processes, but the relationship it supports. In supporting a relationship, decisions are made about what data and processes are relevant. A relational theory of information systems, couched as a definition of an information systems may be stated thus:

An information system mediates a relationship towards an agreed outcome or purpose;
To do this objects-of-interest are manipulated through processes,
Conforming to a negotiated interpretation of the real world.

Further concepts follow from the theory:

- Closer coupling of information system with work process will be ineffective if the information system is addressing the wrong relationship.
- Hidden purpose must be made transparent.
- Purpose proceeds process.

Additionally, an effective theory will generate questions:

- Can an information system support multiple relationships and purposes? Or will there be a clash which will tend towards information system failure?
- In a relationship, who determines purpose? How is power distributed and how does that affect negotiation of purpose?
- How might changing our theoretical lens from process to purpose lead to a different interpretation of the role and function of information systems?
The CMC concerned in the Cunha et al.’s study may be assumed to function to support the customers of Desksales through the storing of details of the customer and recording customer interaction with Desksales. Processes and data entry will be directed at this apparent purpose. But the actual purpose of the CMC is to drive the manager / employee relationship. It becomes clear that the customer is not the subject of the relationship with Desksales, but an object of negotiation in the maintenance of the manager / employee relationship. Since the purpose of the CMC is the mediation of the manager / employee relationship, the importance of the customer as a subject of a relationship is lost. The focus of activity, the goal of the system becomes the maintenance of a model of the real world, managed and negotiated by the manager and employee. The relevance, completeness, accuracy and transparency of the data are then all points of negotiation, mediated by the CMC.

The real world becomes the servant of the information system. The focus of purposeful activity becomes the game-playing driven by the information system. The agreed outcome of the manager / employee relationship is the external goods (MacIntyre, 1981) of sales income, and presumably the bonuses that accrue from sales. Any pursuit of excellence in working with customer in the real world is compromised by the demands of the information system model, driven by the manager / employee relationship. This reification of the external good makes it almost inevitable that participants in the relationship will resort to manipulation and deception to achieve the external goods, by altering the real world to suit the system, by for example, making extra calls to the customer, or falsifying the information system model by adding fictitious calls to the CMC. Elements of coercion, deception and mistrust which contaminate the manager / employee relationship will be reinforced and reflected in the information system. The drifting away from a focus on the customer and the employee customer relationship, which should be its defined purpose, places intolerable stress on any ethical framework and leads to fracture lines in personal and corporate ethics and an amplification of any nascent unethical practice.

7. DISCUSSION

The conduct and conclusions of an interpretive study will be directed by the experience, perceptions and worldview of the researchers, combined with the outcomes of the dialogue between the researchers and participants which progresses during the field study. The view
and concepts which the researcher brings to the study are often pitched as prejudices and bias. But this has a negative connotation, as if they are something which contaminates the purity of the study. Rather they should be seen as experience and insights which may trigger penetrating reflection and deep understanding provided they are combined with a creative openness to new ideas and to exploring new directions. The problem with field research is not that we bring assumptions to the table, but rather that we suppress them.

To do this I have not blinded myself to my experience, or tried to behave as an empty automaton. Rather I have tried to bring to bear on my interpretations my professional experience in systems development and IT services, my teaching in information systems and system teaching and even my propensity towards theological and literary studies. However I recognise that my experience is very limited and others would bring different experiences to the table with different webs of meaning and conceptual artefacts. It will be through interaction and debate within a community of interpreters that rich outcomes will emerge which not only might define an academic field, but elicit real practical value and change.

7.1 The Model and the World

Critically, the purpose of the information system has to be understood. While the information system may be designed to support customer-oriented processes, that design is subordinate to the purpose. The information system is then configured to support that purpose, whether employees are aware of this or not. The information system supports, or rather enforces that purpose through the objectification of the subject of the system. Representation by numbers turns the customer into an object. The information system then legitimises the purpose through mechanisms of rhetoric and appealing to the characteristics and properties of the system. This reference to purpose is further strengthened by the selection and exclusion of data and processes. Once the model is established through the implementation of the information system, it becomes the focus of activity. The information system reifies the institutional purpose and demands that behaviour and real world activities conform to the demands of the model.

Hence the focus of institutional activity and behaviour shifts from the real world to the model. Everything done by the employees and managers serves, feeds and maintains the model. As the model takes root in the psyche of the individual and the organisation, it drifts away from reality and a reality gap develops between real world activities and the imaginary world expressed in the model. As this gap extends, more and more behaviour is directed
toward attempting to force the real world to fit the model. It is not that the model must be adapted to the real world, but that employee activities in the real world must be contained, jemmed into the model. It is through strained effort to force the real world to fit a model that is driven by institutional purpose that unethical practices and activities emerge.

Thus the information systems artefact, whether stone tablets, server farms or quantum computers is merely a substrate on which to grow the model which mediates human relationships. The model is a product of continuous social discourse and the to and fro of the human hierarchies that maintain the social fabric. Those models are both a product of negotiation within social hierarchies and enforcers or precipitators of social hierarchy. The increasing technical power of the information system only serves to increase the level of complexity that can be managed within a hierarchy, the reach of that hierarchical structure and speed of relational exchange in the maintenance of that hierarchy. This may raise questions concerning the value in equating of the social and the material as sociomateriality does.

8. CONCLUSION

Cuhna et al’s study reveals a much deeper meaning of the information system beyond the coupling of data collection with work practices though automation. Indeed, tight coupling may only be a more concerted attempt to conform reality to the demands of the model. Rather the study reveals the importance of viewing an information system as an instrument of negotiation which shapes the relationship between human individuals or groups. It also illustrates how attempts to conform the world to the model may influence behaviour and organisational strategy. I would suggest that the favouring of the model over reality constitutes a significance risk for organisations in a data driven society. If we lose focus on the complex reality of the material world and succumb to the delusion that the data is right, that what the information system say is the truth, then we may be plagued by a cognitive dissonance.

Because the information system only represents our limited perception of the complexities of human interaction. It obscures the complexities of human interaction. A gap may develop between representation and reality. And in our attempt to resolve the dissonance, to close the gap, we change our behaviour and organisational behaviour to conform to the model. Thus
the model has primacy over reality: never mind what the situation may be, the data has the final word, the data is right.

This is a fundamental danger in data science: that we believe the human-constructed fiction over the truth. The relationship is defined by the model, rather than the model being a simplified tool to support the negotiation of a human relationship.

It is therefore the information system researcher’s task to interrogate the model, to expose the gap between reality and representation and to ensure that the focus is on the reality and to subordinate the model to the reality.

REFERENCES

Alter, S. (2016) Nothing is more practical than a good conceptual artefact … which may be a theory, framework, model, metaphor, paradigm or perhaps some other abstraction. *Information Systems Journal*, doi: 10.1111/isj.12116.


## APPENDIX 1. CASE STUDY ISSUE IDENTIFICATION

<table>
<thead>
<tr>
<th>Issue</th>
<th>Issue description</th>
<th>Quote and page no</th>
<th>Theoretical Commentary</th>
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<tr>
<td>Perceived purpose of system</td>
<td>Stakeholders in a relationship have a perception of the actual purpose of a system, beyond the formally stated purpose. There may be a difference between what is stated as the purpose and what is the known purpose. This can be generated by explicit communication, or by rumour.</td>
<td>They feed it [sales data] back to [the company] so that they can say that ‘we are getting value for money’. P329.</td>
<td>Every information system has one or more purposes, agreed by each stakeholder relationship it supports or mediates. That purpose may be explicit – defined in the system documentation and agreed by stakeholders. Implicit, unstated but accepted by stakeholders, or hidden understood by one stakeholder by no reveal to the other.</td>
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<td>Stakeholder as capital object</td>
<td>The information system may support the moving of one stakeholder from the role of relationship participant to managed asset.</td>
<td>You know, [the company] could turn around and say, ‘right, I could get that money in with or without him anyway’, they never know that. But I think the reports show in some way the value we add into the accounts. p329</td>
<td>Information system mediates redefinition of stakeholder as a resource and by objectifying the stakeholder changes the stakeholder relationship.</td>
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<td>Control perceived as result of volume and completeness of data captured</td>
<td>The more complex and comprehensive the information system is, the more complete the picture it gives and hence the greater the perception of control and reduced uncertainty,</td>
<td>How can you justify in that case, if you don’t have the revenue, how can you justify that your salesforce has been working? Because they can’t come around here and check every day that you are with your headset and that you’re taking calls, but if you log all these data it’s a backing for them. p330</td>
<td>Driving an information system to provide greater quantities and reach creates a greater perception of certainty and control.</td>
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<td>Defining relevancy</td>
<td>Capturing certain information and ignoring others defines relevancy and defines what acceptable action is.</td>
<td>If the business doesn’t work, if higher ups say why don’t you have a $4 million revenue, you</td>
<td>The information system data model defines relevant and irrelevancy activity. This in turn influences behaviour.</td>
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<th>Rhetoric of Transparency</th>
<th>Putting numbers in an information system and making them available creates a consensus in the organisation.</th>
<th>can turn and say 'my [salespeople…] made 2 million calls last year and they’ve contacted 2 million people, they’ve sent 10 million e-mails</th>
<th>The lodging of numbers in an information system creates an illusion that everything is visible. And that the organisation is sharing information for the common good. But what has been left out, and the interpretation of the data, and the meaning associated with the data by the powerful ensures that there is no transparency.</th>
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<tr>
<td>Rhetoric of Accuracy</td>
<td>Capturing data in an information system gives it a legitimation of accuracy</td>
<td>“KPIs [key performance indicators extracted from Siebel] measure the way we do business and how successful we are” and that “Siebel is completely transparent”, and that’s one of its major advantages</td>
<td>Accuracy as rhetoric, meaning our results are correct because they’re in the information system.</td>
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<td>Data as justification</td>
<td>Justification of purpose activity and employee actions is enshrined in the recording of data.</td>
<td>She added that “as you know, Siebel is part of the E-Tel transformation and DeskSales is on top in accuracy”. She adds that “we need to keep being the most accurate”</td>
<td>The outcome as digitally represented becomes a virtual proxy for the actual real-world outcome of the activity. Work is justified by the information system representation alone.</td>
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<td>Shift of purpose result in shift of purposeful activity.</td>
<td>Focus of work become the maintenance and population of the model, not the pursuit of real-world activity</td>
<td>are happy. p330.</td>
<td>The work on the information system becomes a purpose and goal in itself which is disconnected from the actual work it is supposed to represent.</td>
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<td>Erosion of trust</td>
<td>The use of an information system as a prime source of evidence of activity and a means of judgement amplifies and speeds up the erosion of trust</td>
<td>if you don’t have the revenue, how can you justify that your salesforce has been working? Because they can’t come around here and check every day that you are with your headset and that you’re taking calls, but if you log all these data it’s a backing for them.</td>
<td>The information system becomes a focus of conflict and argument about the nature and legitimacy of real world activity. The extended use of the information system may start from an erosion of trust in a relationship, but only serves to increase the lack of trust as the focus moves away from what is actually happening to what the system says is happening.</td>
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<td>Climate effects</td>
<td>Real world effects and influences on the performance of a human purposeful activity system may be excluded and ignored because they cannot be captured in the information system</td>
<td>unfortunately they don’t want to buy, the customer doesn’t want to buy, because of climate. P330</td>
<td>Climate change, culture and context cannot be captured in the bounded limited model of the information system. Hence exclusion of those produces a narrow and myopic view of the system resulting in employee frustration and conflict.</td>
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<td>Quantitative enforcing</td>
<td>The information system pushes thing towards the focus on institutional derived measurable which enforce a specific perception of what is legitimate action.</td>
<td>KPIs [key performance indicators extracted from Siebel] measure the way we do business and how successful we are” p330</td>
<td>Use of measurables which simplify the complex and are selected by the powerful bias the argument and disempower participants in the relationship which is mediated by the information system.</td>
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<tr>
<td>Setting the agenda.</td>
<td>Information system becomes the focus of the power of meaning.</td>
<td>“Siebel is where DeskSales can be ambassadors and leaders” p330</td>
<td>Engagement with the information system can be imbued with meaning concerning institutional aims and goals and concerning what is legitimate in leadership.</td>
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<td>Productivity illusion.</td>
<td>Illusion that entering data into an information systems and manipulating models is productive work</td>
<td>So it takes a lot of time and it’s unproductive work as well because it doesn’t help you make more sales; it’s just</td>
<td>Management and use of information systems seem by managers as productive work, but may not actually be productive but actually inhibiting productivity through a shift from reality to model.</td>
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<td><strong>affecting reality.</strong>&lt;br&gt;looking back, so that justification process is quite frustrating. P330</td>
<td><strong>Information system measures something different from what actually happens.</strong>&lt;br&gt;all they’re doing is managing their email, […] they do take a lot of orders, they do a lot of work that they’re not supposed to do and I don’t know how much time is wasted p331</td>
<td><strong>Activities measured by information system are not the ones undertaken by staff.</strong>&lt;br&gt;This arises from a purpose gap. Here the purpose articulated by managers is creating sales. But this does not align with the purpose of the employees. The question is where is that mismatch? Someone must be telling the employees what to do.. manage email, take orders. Therefore the gap arises from hidden conflict in stakeholder’s purposes.</td>
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<tr>
<th>Immeasurability of human purposeful activity</th>
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<td><strong>Management requires measuring and trapping information in the information system.</strong>&lt;br&gt;Many aspects of purposeful activity cannot be measured or lose their meaning and value once they are measured.</td>
<td><strong>My initial feeling is that there is a lot of time wasted, but I don’t know how to measure it</strong> p331</td>
<td><strong>Many human activities are very difficult to measure and once we measure them, they loo their value. An analogy is in quantum physics in the uncertainty principle where momentum and position cannot be simultaneously observed.</strong>&lt;br&gt;In information systems an organisational phenomenon is reduced in its information richness once an attempt is made to observe and measure it. Hence we have a paradox, that one the one hand, systems cannot be managed without measuring, on the other hand the system we wish to measure are fundamentally immeasurable and the organisational phenomenon disappears once an attempt is made to measure it.</td>
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<th>Administrative detachment of information systems</th>
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<td><strong>Sales persons are so focussed on their purpose that they don’t get round to, or specifically don’t want to enter sales details to gain the reward.</strong></td>
<td><strong>human beings don’t want to do that side of administration really, particularly the kind of people that you have in here that want to earn money, that want to spend their time making money. They don’t want to spend their time on Siebel, do they?</strong></td>
<td><strong>If the IS is sufficiently disconnected from the actual purposeful activity, motivation will become so long that even the advantages for the user are lost. Here the internal goods, the internal purpose so overrides the external goods or reward that the system ceases to be used.</strong></td>
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<th>Bounded information access</th>
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<td><strong>Figures on a whiteboard exposed every sales person, while using a spreadsheet provided some smokescreen.</strong></td>
<td><strong>I don’t particularly want to be exposed. Exposed the people that made the least deals… [The spreadsheet is] not something people can walk by every day and look at. P332</strong></td>
<td><strong>Information system can restrict access so that only a selected group of stakeholders have knowledge of what is important to the institution.</strong></td>
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<th>Right queries</th>
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<td><strong>Company experts certain figures, certain queries to be</strong></td>
<td><strong>He said, “next week, we’ll go into a meeting room</strong></td>
<td><strong>IS open to interpretation. Interpretation set by, defining meaning of data and declaring how the data is to be</strong></td>
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<td>Management of consistency</td>
<td>Consistency in reporting required by management. He said that because, when they are preparing their own report, &quot;you need to be consistent about how you get your numbers.&quot; Dominant stakeholder or group of stakeholders exercising power will define what is consistent. I.e. what is the accepted single view of the data.</td>
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<td>Information system determining purpose.</td>
<td>Seibel defines targets which employees are required to know if they are questioned by senior managers. He went on by saying that with senior managers being around the floor, in addition to all of the top management’s visits, “if somebody comes and ask you, you want to know [your targets].” Information system as instrument of purpose definition. Moving purpose and hence motivation to quantitative measurables.</td>
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<td>Information systems as an instrument of self-monitoring</td>
<td>Desk sales staff are expected to monitor themselves. Siebel. […] it’s the way we’re going to help you monitor yourselves, so that you know where you are at any moment in time.” p332 Once an information system is socially accepted as a mediator for behaviour in a relationship, the user’s focus on the relationship will be such that the information system becomes the behavioural mirror.</td>
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<td>Conceptualising purpose</td>
<td>Purpose is determined by the IS artefact and driven by the IS artefact. The goal becomes improving numbers in Siebel, rather than improving customer service etc. He added that “this week you need to be on 60% against target, so if you could pull some good numbers this week, that would be great.” He said that he was willing to pay for a night out for them if they did “really good numbers in these next six weeks.”p332 George started his meeting by saying that he wanted to talk “about your numbers,” p333 An IS accepted by a practice as the mediator of that practice will move the focus and reward from goods of excellence to good of efficiency. The IS further shifts the purpose from a real-world achievement of material or human change to a focus on a cognitive purpose.</td>
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<td>Gamification of purposeful activity</td>
<td>Focus on Siebel data and targets means the purposeful activity of serving He got up and went through the first six rows in his league table and told Jeffrey, “you’re in Creation of comparisons, league tables, reduces actual purposeful activity to a servant of a game. Hence actions are undertaken in order to obtain rewards in the information system. A behavioural</td>
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customers is reduced to a secondary activity performed in order to play the game dictated by the information system.

sixth.” Mark was in second; “p333
He added that “next week we need to be on 63% target.” He then told each person what their percentage was against their target and told the lower scorers, Peter, John and Ann, “you’re on 30% but with a couple of big wins, you’ll be able to pull back.” P333

condition occurs, where the actual actions are undertaken for a reward inside the system, in this case hitting targets. The real world action becomes a lever pulled to obtain the virtual reward. Since this indicates a total focus on external goods, the external good dictated by the institution, there is a total inhibition of the pursing of internal goods and hence leaving an open door to deception and manipulation.

Reification of the external good

The targets, logged data becomes the purpose, the point, the goal of the activity.

George then talked about the top wins for last week worth about 2million dollars each. He then said that they had logged in 19 opportunities last week and congratulated them on that. P333

Use of information system not only gives preference to quantitative measure of external parameters such as income etc., it also turns qualitative, internal goods, measure of internal motivation into external goods. So the pursuit of excellence becomes a measure of excellences which acts as proxy for the qualitative phenomena.

Information Systems as impression management tool

Desksales employees status, identity and the impression colleagues and the company have of them is determined by the figures in Siebel.

He said that his manager told him that he had to have a pipeline because “it looked bad on Siebel” if he didn’t have one. P333

Workplace identity is enshrined in the information system. And identity is then affected if not determined by the figures, the image in the information system. Workplace identity is enshrined in the information system. And identity is then affected if not determined by the figures, the image in the information system.

There is a feedback loop created whereby a dependency on the information system is established. The information system becomes an adjustable mirror. I look in the mirror to change myself, but I also paint over or manipulate the mirror towards the perception I have of myself, or of what I want to be.

Activity exclusion

The model in Seibel assumes that all activity is sales activity for which the entire responsibility lies with the employee. It excludes complex team interactions, dependencies, complex classes of activity and cuts to

Victor explained that he didn’t have anything in the pipeline because his accounts are subcontracting, so he is dependent on his customers having a pipeline and sharing it with him. P333

Information systems work because they: Cut complexity and limit options, Create standardisation, Isolate the individual. This means that any complex network of activities constituting a purposeful activity system will defeat the information system.
<table>
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<tr>
<th>Reinterpretation of reality to match the perception of the information system</th>
<th>Calls to check goods have arrived, to give a quote are interpreted as winning revenue.</th>
<th>Nina explained that though Robert’s involvement was limited to calling the stores to make sure they got the discs, ‘even making a quote [giving the price of a product] is involvement.’ She concluded: ‘What I would do is ask the account team [i.e., field salespeople] if there’s something I can do to help.’ She added, ‘basically, the more you look, the more you’ll find, and it’s a way to get revenue without having to sell anything. Of course, you will eventually have to sell something, but it’s a good way to hit numbers.’ P333</th>
<th>Desire to when the game, as defined in the information systems results in reclassification of real world actions to fit the virtual game being played in the information system.</th>
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<tr>
<td>Information systems as a tool for coercion</td>
<td>Figures put in Siebel are interpreted by employees and by managers as a tool for coercion because employees are penalised if the figures aren’t good.</td>
<td>it’s just another system. Something that I have to use, something that I have to put stuff on there, otherwise I get penalized, so that’s the reason I hate it. P334</td>
<td>Figures in an information system are used to reify the gap between expectation of planned activity and perception of delivered activity. This can then be interpreted as a evidence of bad behaviour to be punished. Hence the information systems is used to support threat of punitive action. Conversely, the exposure of a gap could be interpreted as an opportunity to support and help the employee to do better, as an indicator of a need for wise managerial intervention to help develop the employee.</td>
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<td>Alignment of the real world and the model world is a moral activity.</td>
<td>There is an awareness of what Siebel records is a model world which has drifted away from the real world.</td>
<td>I believe that my sales managers are stats driven. They have to produce spreadsheets day in and day out, and they can only talk about figures. Figures isn’t the real world. Figures is not a sales world.</td>
<td>Alignment of the real world with the virtual world, the information models residing in the information system is a moral human activity. It requires an understanding that the information system isn’t the real world. This is sometimes not there and the IS is the real world as far as the actors are concerned. That having been discovered, it further requires the exercise of moral strength to: Balance the external and internal goods in a reasonable way. It requires the</td>
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| Information system as proxy manager. | Siebel becomes the way desksales are managed.  
Examining the figures and managing jus by what the numbers say creates a kind of management automation, | So I think that most salespeople are driven to fulfil the role of Siebel, and if you ask who my internal manager is, it’s Siebel. P334 | The information system which starts as a tool for mediating and supporting interaction between the manager and the employee, one tool in an ongoing supportive and productive relationship becomes a means of automating management. In pursuance of a total automation of management, the IS becomes effectively a robot manager. Hence the IS becomes a tool by which managers abandon responsibility to actually manage, to engage meaningfully with the employee and make deep decisions rather than surface decisions, superficially justified by the information model. |
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<td>Legitimisation of management expectations by data visualisation.</td>
<td>Introduction of traffic lights system give increase legitimacy to management expectations.</td>
<td>Jeremy said this morning [in the team meeting] that they’re going to introduce something that will have red-amber-green, which will tell you how far away from your target for the month that you are. P335</td>
<td>The use of visualisation approaches such as traffic lights enables managers to set targets and expectations which are perceived as legitimate and are less likely to be questioned. Traffic lights are a classic example of a visualisation which connects with underlying behavioural conditioning.</td>
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<tr>
<td>Information system as instrument of power.</td>
<td>Employee, referencing whiteboards, highlights the use and deployment of the system as making him feel like a kid.</td>
<td>I hate [the whiteboards]. I don’t think they’re useful at all: they don’t help, they don’t increase morale, they don’t make you want to work hard, they make you feel like kids, you know. P335</td>
<td>Use of IS by managers treats employees as children and creates an inferiority complex, trivialises ambition and purpose and pushes towards trivial external goods. Creation of a behavioural conditioning system nullifies deep purpose. The reduction of meaning to trivial point scoring games, creates managerial simplicity and employee pliability.</td>
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<td>Information system encourages alignment of bottom line individual and institutional purpose.</td>
<td>Employee states that his goals is to make money and that this aligns with the organisation’s goal.</td>
<td>“My goal is to make money.” He did not have any career aspirations within E-Tel, “this means that my goals are aligned with the company because what the company wants is to make money.” P335</td>
<td>Information systems reflect and enforce company goals. This makes the quantitative much harder to support than the qualitative and shifts the focus to external goods.</td>
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| Amplification of Managers | “I’m getting | Focus moves from actual purposeful | }
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<th>unethical practice.</th>
<th>encourage employees to make up sales figures.</th>
<th>pressure from [my sales managers] to make up fictitious sales calls to hit targets”.p335</th>
<th>activity to representation of purposeful activity. As targets are dissociated from real life, temptation to unethical practice increases because of the behavioural need to reduce the cognitive dissonance between the actual and the representation.</th>
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<tr>
<td>Information system as game representation</td>
<td>The support and manipulation of the game becomes a prime purposeful activity in itself, taking time away from the actual service activities.</td>
<td>After finishing entering three new opportunities in Siebel, Marion complained aloud, “not enough time for customers in a day, there’s so much internal stuff to do”. Jeremy, another desk salesman on Marion’s team warned: “focus on your customers, girl, otherwise you won’t earn any bonus.” Marion replied: “it’s all fun and games!” Jeremy agreed, “it’s complete a waste of time […] it takes forever”. Marion concluded, “this is what I hate about this job, having to do all this admin crap.” After finishing entering three new opportunities in Siebel, Marion complained aloud, “not enough time for customers in a day, there’s so much internal stuff to do”.</td>
<td>The information system becomes a trading game in which the actual purpose activity is subjugated to the purpose of the game. And the information system becomes the determiner of purpose, the actual world must then be manipulated to fit the representation.</td>
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<td>Honest representation</td>
<td>The representation of activity in Siebel is regarded from an ethical viewpoint.</td>
<td>… granted I haven’t done much but at least [the number of calls reported in Siebel] is an honest representation of what I’ve done. What if my [field salespeople] look at Siebel and see them [the fake sales calls] and ask me ‘what is this?’” p336</td>
<td>Honesty and trust in an information system requires that the data entered correspond to the real world and is not fabricated. However, interpretation of the agreed reality and the alignment of its representation in the information system requires a consensus as to what the norm is. It requires a single view of the data, a single agreed interpretation of representation and meaning. Actors may claim that there is an objective view of this, but that is a matter for debate.</td>
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<td>Relationship mediation.</td>
<td>Siebel mediates a relationship between two groups of actors: desksales staff and managers. If the key relationship is between desksales staff and customers, Siebel does not address that.</td>
<td>The key to it all is the actual relationship with the customer because the customer will come to me…. One of the good things about [DeskSales] is that there’s always somebody there for the customer to speak to, outside the service arena. And I think that as far as I’m concerned, I’ve built trust with my customer and that helps. P336</td>
<td>Information systems mediate relationships. They provide a basis for interpretation and consensus between two groups. Data within the information system becomes the object of discussion and debate between the two groups in the relationship. Here Siebel does not align or couple because it is not addressing the relationship between the desksales employee and the customer which is the focus of the purposeful activity. The critical role of an information system as a relationship mediator also requires and engagement with issues of trust and power.</td>
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<td>Information System Impact</td>
<td>The actual impact of Siebel is purely in sales person remuneration. It appears to have no impact on the customer. Hence a ‘reporting system’ is requisitioned to drive the behaviour of sales staff through the distribution of rewards.</td>
<td>Siebel is a reporting tool and a reporting tool only, and this is why I’m amazed we’re paid off a reporting tool … because you can put a figure in and that figure can be anything and you’re paid on that…. [Field salespeople] are paid on [the revenue tracking system], which is</td>
<td>A key question is what is the impact of an information system and how does the manipulation of the representation change the real world and how does that feedback to the representation. Analysing the impact, the decisional output and their effects on the organisation and the system will tell us something about the real purpose of the information system and the relationship it mediates. An information system which is reporting must have an impact transmitted to the real world through managerial / organisational decisions. If this is not occurring the IS is then</td>
</tr>
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money that goes into E-Tel’s bank. We’re paid on the money that we think is going to go into the bank, but nobody ever checks that it’s going into the bank. The reason is that it’s so difficult with all the opportunities on there to track them through to [the revenue tracking system] that I am not sure it will ever happen. P337 sterile, has become a servant of a reporting for reporting sake culture and should be decommissioned.
Explaining Technology Adoption with Financial Motivation
Research-in-progress

Abstract
Several theories and their variant extensions have been posited to explain or to suggest factors that influence technology adoption. However, these theories seem inadequate in certain scenarios. For instance, none of such technology adoption theories identify or account for the possible influence of external non-personal and non-technology incentives or rewards or compensation on persons faced with the choice to accept or use a technology. However, existing psychology research posits a positive correlation between the offer of financial incentives and task. Therefore, this paper purposes to uncover the philosophical and theoretical underpinnings to this suggested relationship, and also to provide observable empirical evidence in support.

Keywords: technology adoption, financial motivation, qualitative research

Introduction
The acceptance and use of new technology is not an exhausted issue in information systems research. This observation is evidenced by the many theories and their variant extensions that attempt either to explain or to suggest factors that influence technology adoption. Despite their utility, these theories still harbour some inadequacies which yearn for fixing. Specifically, these theories have the understood assumption that people will accept and use technology because of factors pertaining to the technology in question, social conditions, and some personal considerations. Arguably, none of such technology adoption theories identify or account for the possible influence of external non-personal and non-technology incentives or rewards or compensation on persons faced with the choice to accept or use a technology (see Rondan-Cataluna, Arenas-Gaintan, & Ramirez-Correa, 2015 for a comprehensive review of technology adoption theories). Meanwhile there are some contexts in which technology adoption could be considered a task; consider an advertising company contracting an individual to install a digital advertising screen in her vehicle. In such a scenario, the factors posited by extant technology adoption theories become inadequate because that individual may consider factors like task-related compensation. Further, existing psychology research posits a positive correlation between the offer of financial incentives and task performance (Becker, Clement, &
Schaedel, 2010). Therefore, this paper argues that it is compensation, especially financial compensation can influence technology adoption. This study thus purposes to uncover the philosophical and theoretical underpinnings to this suggested relationship, and also to provide observable empirical evidence in support.

Addressing consumers' economic motivations for accepting technology is not a minor issue because of the glaring evidence which points to positive correlations they have with task performance (see Becker, Clement, & Schaedel, 2010). This study makes two main contributions to technology acceptance research in seeking to explain this relationship. First, the study provides alternate explanations for the acceptance and use of new technology. Given Fishbein & Ajzen's (1975) observation that many variables affect the choice of how and when users will use a new technology, focusing on only the extant factors is a way of blinding ourselves to other working factors like financial incentives. Therefore, this paper in responding to calls for alternative theoretical mechanisms in information technology adoption research (see Bagozzi, 2007; Venkatesh, Davis, & Morris, 2007), argues that there is a propensity for people to accept technology not just because it is useful or easy to use, or other people are using it, but because of expected financial incentive. Second, using interpretive epistemology and critical realism ontology, the study presents a case study of a very unique situation in which financial motivation influences the uptake of a new technology. Further, an accompanying in vivo analytical technique is used to extend the frontiers of a traditional technology acceptance theory, the UTAUT (Andersen & Kragh, 2010). Given the theorising nature of the case study method and in vivo analytical technique, it is plausible to consider the ensuing explanations as improvements in existing explanations for technology acceptance.

**Preliminary Literature Review**

Several predictive and explanatory theories of technology adoption and/use has been advanced (see Rondan-Cataluna, Arenas-Gaintan, & Ramirez-Correa, 2015 for a comprehensive review of technology acceptance theories). Despite their usefulness, the myriad of extension and revision attempts suggest their seeming insufficiency to explain either the adoption of certain technologies, or of technologies in certain contexts and situations. For instance, Ozkan, Bindusara, & Hackney (2010) advance
perceived advantage — the perception of a system's potential to reduce paperwork and be cost-effective — as an important factor in individual's adoption of electronic payment systems (see Venkatesh, Thong, & Xu, 2012; Wang & Lin, 2012; Alotaibi, 2013; Slade, Williams, & Dwivedi, 2014; Sheng & Zolfagharian, 2014; Liu, Zhao, Chau, & Tang, 2015 for more examples of such extensions). Beneath such extensions lie the assumption of a separate human entity deciding to adopt and use a certain technology. The context of this assumption is pertinent, hence, Venkatesh, Thong, & Xu (2012) distinguishes between an individual's adoption of technology within an organisation, and the other outside an organisation i.e. a private consumer, in advancing the UTAUT2 model. Private consumers face peculiar situations like financial risk, price value and motivation (Sheng & Zolfagharian, 2014; Venkatesh, Thong, & Xu, 2012).

We may be tempted to forcibly classify such peculiar factors under UTAUT's facilitating conditions - individual's perceptions of the resources and support available to adopt technology (Venkatesh, Morris, Davis, & Davis, 2003). The implausibility of such attempt, however, is evidenced by the advancement of hedonic motivation and price value as factors for private consumer adoption of technology (Venkatesh, Thong, & Xu, 2012). Whilst there has been an attempt to extend technology adoption theories with motivation, the focus of such attempts have been insufficient with regards to all its possible forms. Venkatesh et al. (2012) for instance speaks of only hedonic motivation, thus overlooking non-hedonic extrinsic material motivation or rewards. In fact, such forms manifest in several forms as recognition programs, profit-sharing programs, pay increase, benefits and incentives (Govindarajulu & Daily, 2004). The argument here then is that these material forms of motivation can influence private consumers who consider financial risk, and are looking for tangible benefits, to adopt some technology or vice versa.

Such an argument is not far-fetched if we further consider the private consumer in two forms; on one the one hand, the private consumer who is buying/adopting a technology for personal use and to achieve hedonic or even work-related satisfaction, and on the other hand, the private consumer who is acquiring/adopting a technology for financial gain. As Venkatesh et al. (2012) as already demonstrated the existence of hedonic motivation, let us consider its opposite. We know that a person will
voluntarily act because of gaining a selfish reason after identifying a higher pay-off in a cost-benefit analysis of acting; and a financial pay-off guarantees more action (Darrington & Howell, 2011, p. 43). We also know that financial incentives shape individual's preferences, and can even destroy her intrinsic motivation (Bowles, 2008). Therefore, direct financial rewards attracting individuals to share their internet service and act as hotspots is not at all trivial (see Becker, Clement, & Schaedel, 2010). Based on this argument, and attempting to move away from existing theories' limited explanatory or predictive possibilities, triviality and lack of practical value (Garača, 2011), this study advances the third version of the Unified Theory of Acceptance and Use of Technology (UTAUT3).

**Proposed Research Methods**

The empirical study will be approached with interpretive epistemology (Walsham, 2006) which suggests the gathering of qualitative data. Interpretivism is important because private consumers may have different conditions that motivate them to adopt technology, and different conceptions concerning such conditions. Thus, the aim to understand how individuals view financial motivation, and why it influences them to adopt technology makes it important to capture subjects' interpretative meanings.

**Research Approach**

A case study approach (Cresswell, 2007) will be used to understand the influence of financial motivation in individual's adoption of technology. This issue was conceptualised through observation of the In-Taxi Ad Project (iTAP) being executed by Tech Nation, an Australian/Ghanaian owned technology-based company operating in Ghana (Tech Nation, 2015). iTAP involves the installation of interactive headrest screens showing 'infotainment' to passengers who board commercial vehicles. Drivers who agree to the installation in their vehicles sign an agreement which guarantees monthly financial rewards for ensuring daily operation, and indemnity if the device is broken or lost. To this end this study will delve into Tech Nation's commercial driver recruitment activities and related documents, even on the driver side to understand the mechanisms that enable. In operationalising this approach, purposive sampling will be used to select drivers who will be respondents; these drivers are those who have the screen installed in their cars.
Data Collection Methods

Data will be collected from meetings with Tech Nation management and staff, the company's website, and members of driver unions that Tech Nation has approached and installed their digital headrests. Documents like contracts, terms and conditions, and product descriptions and manuals will also be examined to ensure credibility of the interpretive epistemology to be adopted, and the veracity and dependability of the data.

Meetings. Face-to-face meetings will be held with the management and implementation or technical staff of Tech Nation to understand the rationale for giving financial rewards to taxi drivers who subscribe to iTAP, and the impact of such rewards on subscription.

Interviews. 30 taxi drivers who have joined iTAP, and 30 drivers in the same taxi terminals but have not joined iTAP will be interviewed to solicit their reasons for subscribing or otherwise, respectively. The interview data will be coded to reveal the perspectives of the interviewees concerning what influences their adoption decisions.

Website Content Analysis. Videos, audios, images, and text on Tech Nation's website will be analysed for information concerning iTAP. Such data will serve as triangulation and corroborative data for information gathered from interviews and meetings.

Documents. Subscription contracts and service level agreements will be reviewed to verify payment amounts and risk management arrangements between the subscribing drivers and Tech Nation, as corroborative data.

Data Analysis

Analysis of this study's data will be approached with deductive reasoning (Ven de Ven, 2007). Deduction will be adopted to explain how material rewards influence the uptake of technologies by private individuals outside an organisational setting. The other reasons for technology adoption as proposed by version 2 of the Unified Theory of Acceptance and Use of Technology (see Venkatesh, Thong, & Xu, 2012) will also be identified from the data and coded using NVivo qualitative analysis software, and their inherent and contextual explanatory inadequacies discussed.
References (Font Size=14)


EXPLORING THE RELATIONSHIP BETWEEN ONLINE SERVICE FAILURE, RECOVERY STRATEGIES AND CUSTOMER SATISFACTION

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Research in progress

Abstract
This paper aims to analyse perceptions of online service failure-recovery and customer retention in relation to the creation of satisfactory experiences for both customer and providers in the banking sector. In specific, the negative impacts of service failures and the positive effect of recovery strategies are assessed. Online service failures can have adverse impacts on profitability, and on- and offline service failures are inevitable in the service industry. A number of observations are made with implications for customer and provider experience in the banking sector. The purpose of this paper is to divulge predominant academic insight into a consistent provider-customer interaction and unlocks new perceptions for future academic study by examining the phenomenon from the perspectives of both providers and customers.

Keywords: Online service failure, Service recovery, Customer satisfaction, Customer retention, Post recovery behaviour, Banking sector

INTRODUCTION
Service failures can be defined as faulty results which reflect a breakdown in consistency (Berry & Parasuraman, 1992). Similarly, service failures have been defined as “service
performances that fall below customer expectation” (Hoffman & Bateson, 2010, p.327). Others have described service failure as any service associated calamity or trouble that occurs during the experience of a consumer in their dealings with a company (Maxham, 2001). Some researchers have argued that it can be expensive for service providers to delay tackling service failures. Such failures can also lead to consumer refusal (Liu et al., 2000; Maxham, 2001; Kotler & Keller, 2011). The idea of online service failures is based on ECT (Expectation Confirmation Theory) and can be defined on the basis of the conventional “gap” framework of service quality (Oliver, 1980; Parasuraman et al., 2005). Online service failure is defined as “the gap that occurs when customers’ perceived quality of service delivery does not match their service expectations” (Tate et al., 2014. p. 2). E-tail consumers experience various online service failures as compared with their conventional retail counterparts (Kelley et al., 2005). Consequently, novel failure recovery strategies are essential in order to deal with online service failures.

The literature on service failure and recovery strategies focusses on understanding the perspectives of customers surpassing explanations from the provider’s viewpoint (Parasuraman et al., 2005; Zhu et al., 2013). The provider’s outlook is often anticipated and can be approached from the perspective of two different types of performers which are enacted in order to enrich the experiences of customers (Grewal et al., 2008; Huang et al., 2013). Consumers have been conceptualised as entirely same experiences through the service failures and recovery strategies with limited exceptions that affects the subjective fact in the occurrence (Maxham & Netemeyer, 2002). Earlier studies have suggested that failure severity and critical failure have a substantial impact on consumer satisfaction. These can lead to adverse word-of-mouth communications and reduced levels of consumer loyalty. Previous studies (Jones et al., 2004; Azemi & Ozuem, 2016) have investigated the effect of service failure severity on trust, loyalty, consumer satisfaction and negative word-of-mouth. Research has found that service failure severity has a substantial effect on consumer trust, loyalty and adverse word-of-mouth. Likewise, Kim and Ulgado (2012) investigated the perspectives of consumers in relation to service failure severity, repurchase behaviour and recovery satisfaction in hospitality services. They concluded that service failure severity has a substantial adverse effect on consumer repurchasing behaviour.
CONTEXTUALISATION: ONLINE SERVICE FAILURES

A complete outline of the literature ascribes the experience of service failure-recovery to a five-stage procedure that is service failure occurs, recovery expectations, provision of recovery strategies, evaluation of recovery and post-recovery behaviour. Conversely, understanding of the consumer is prominently related with particular process stages affecting descriptions inherited to the missing stage (Mohr et al., 2006). Accordingly, experience of consumers accounts for particular backgrounds exceeding the possibility of further descriptive aspects (Rio-Lanza et al., 2009; Mattila & Choi, 2008). It is revealed from above-stated that the literature has been established in a context-free method from a positivist ontological view and responses of consumer are highly concentrated and organised. It indicates that the service failures and recovery strategies phenomena are related with a iterative experience. Moreover, the experience of the customer is anticipated during the service failure-recovery. Consequently, Miller et al. (2000) illustrated that the literature on the service failures and recovery strategies are recognised with the attempts of academics to assign the customers’ perceptions in service failures and recovery to the objective fact.

Nevertheless, the literature sets out some contrasting and contradictory outcomes. It advises that consumers are heterogeneous and need to be managed subjectively (Diaz-Martin et al., 2008; Wang et al., 2011; Azemi & Ozuem, 2016). The existing literature on service failure and recovery strategies sets out a number of advantages associated with service recovery. Rust & Oliver (2000) argue that suggestive outcomes affirm that acceptable recoveries might be harmful to the service provider. This provides an indication of how distinctive consumers are from a realist perspective. The author suggests a contextual method for understanding service failure and recovery strategies which places the consumer at the heart of analysis. The literature on service recovery also follows a particular epistemological orientation (McCarthy et al., 2011). Electronic media literature appears to have established the underpinnings to research into service failure and recovery strategies, while the evolution of the internet has exposed offline service failures and recovery strategies from the perspective of traditional offline practices (Salle et al., 2015; Ozuem et al., 2016). It has been suggested that Computer-Mediated Marketing Environments (CMMEs) have empowered society, and have allowed consumers to develop insights highly individualised orientations to the world of consumerism (Ellis-Chadwick & Chaffey, 2012). This underscores the subjectivity of the insights of consumers and relates service failure and recovery strategies to experiences of impulsive results.
Moreover, the practice of providers observing consumers has also been highlighted and authors have related service failure-recovery occurrences to the combined experience created between the customer and the provider.

Ozuem & Lancaster (2013) attributed the service failure-recovery experience to interactions between consumers and others as part of the process of social constructivism. The present study suggests that service failure, recovery expectancy and appraisal, as well as after-recovery actions are formed through interactions between consumers and providers. This suggests that individuals constantly accept the latest information that matches and substitutes the inherited characteristics. This contrasts with work undertaken by Ringberg et al. (2007) since the present research does not separate out the inherited characteristics of customers before service failure occurs. This study views service failure and recovery strategies as combined initiatives that are carried out in concert between providers and consumers. It evaluates service failure-recovery from the perspectives of both customers and providers in order to develop an understanding of the topic. The study presents a contextual and inclusive conceptualisation of consumers during service failure-recovery procedures. The researcher is not isolated from the research context because a social constructivist approach is used. Strauss (1988) states that such an approach links data enrichment to the empirical data of the researcher. Maxwell (2012) illustrated that empirical data can include the personal and professional experiences of the researcher as part of the studied phenomenon. The personal, professional experiences and background of the researcher have therefore directed the current study which is produced in the context of online service failures and recovery strategies in the banking sector of Nepal. Nepal is a developing nation and Ringberg et al.’s study is limited to only the developed nations. Therefore, investigating online service failures and recovery strategies in the Nepalese banking industry represents a timely addition to the existing literature.

Academics have identified descriptions of service failure-recovery occurrences based on feedback from customers (Wirtz & Mattila, 2004; Vazquez-Casielles et al., 2008). Similar approaches and comprehensions of the scholars’ tendency during the service failure and recovery strategies procedures overlook the literature (Cheng et al., 2012; Huang et al., 2014). This type of positivist orientation creates limited explanations as to the specific antecedents and process phases associated with service recovery (Chou & Lai, 2015). Furthermore, it is related the occurrences to an iterative experience as well as behaviour and reactions of consumers to an expectable one. The positivistic approach to understanding consumers appears
to have obstructed the clarifications inherent to the key theory. Regardless, academics have attempted to understand service failure and recovery strategy occurrences from various theoretical approaches such as justice and appraisal theory (Azemi & Ozuem, 2016; Mohr et al., 2006; Zhang et al., 2013). The above-stated developed contradictory outcomes in the studies relating the occurrence with complicated issues (Choi & Choi, 2014). It indicates, focus to customer’s perspective, the descriptions on how in reality consumers acquire service failures insight and recovery expectation and assessment to construct after-recovery behaviour decisions are confined. Therefore, the present research paper approaches consumers as heterogeneous and it relates the conceptualisation of the customer’s perspectives on service failure-recovery to state of their mind.

**SERVICE RECOVERY IN BANKING SECTOR**

It is essential to rectify the problems of service failures in the banking sector on account of the costs associated with gaining new clients. Such costs are five times higher than the costs associated with the retention of current clients (Maxham, 2001; Gitomer, 2013). Such high costs are associated with the expensive nature of marketing activities required to attain new clients. Furthermore, service providers could harm the long-term success of their business if they are unable to recover service failure properly (Magnini & Ford, 2004). Accordingly, Tschohl (2013) stated that an effective recovery strategy can reduce negative feelings and increase positive sentiments amongst customers.

According to Jan & Younas (2012), service recovery is essential in the banking industry. They argue that “customers may avoid complaining about minor service failures, however, in the financial institutions like banks there are no minor service failures as it is the dealing of money” (Press et al., 1997, p. 74). Moreover, a study of the Australian banking sector found that customers do not tolerate minor service failures, for instance charging additional fees on their accounts. The findings of the study advised that banks must make an effort to deliver their services appropriately on the first occasion to avoid unsatisfactory service experiences (Valenzuela et al., 2013).

Consumers are likely to switch banking service providers if the service recovery they experience does not fulfil their expectations (Zeithaml et al., 2012). However, it has been argued that customers are likely to publicize more intense negative sentiments if they no not
perceive of a sufficient level of service recovery following service failure (Neira et al., 2010; Ayertey & Ozuem, 2017). Therefore, service recovery can be approached as a second opportunity for the service provider to address failings as soon as they occur (Bowen & Johnston, 1999). The efficient management of failure has an effect on the satisfaction of customers and their intentions to switch service providers (Ahmed & Amir, 2011). Service failure recovery is considered a key factor behind the customer’s decision to switch service provider (Azemi & Ozuem, 2016).

**MANAGERIAL IMPLICATIONS**

Studies of online service failure and recovery strategies first emerged earlier this century and so the topic has not been fully and adequately conceptualized (Boroumand et al., 2008; Fan et al., 2010). Researchers have attempted to transfer some of the conventional wisdom associated with offline failure recovery literature to online settings with mixed success (2014). Descriptions of service failures and recovery strategies emerge to be apparent as they affect the risks and opportunities accredited to the multifaceted type of digital setting (Piercy & Archer-Brown, 2014). The existing literature on service failures and recovery strategies shows that failing to understand the consumer is main reason for the ambiguity and complications that have been identified by academics and specialists (Netemeyer & Maxham, 2002; Lo & Wu, 2012; Zhu et al, 2013). This would suggest that comprehending service failures and recovery experiences from an online perspective is essential to create positive recovery platforms. The above discussion emphasizes the need to comprehend and relate service failures and recovery to hypothetical situations leading the present researcher to explore the phenomenon comprehensively.

The present study delivers substantial indicators for managers in the service sector. Apologizing, compensation, confirming a speedy response to the consumers and following-up have been acknowledged as effective recovery strategies in order to increase consumer satisfaction (Smith et al., 1999; Gelrich & Roschk, 2011). The findings advise that the businesses should have possible recovery strategies that they may implement in order to resolve service failures. Service failure is usual and consumers may experience disappointments in the service industry after failure occurs. Therefore, it is essential that managers should train employees to respond to disappointed consumers with a recovery compensation in a way that expresses sincere regret for the service failure (Lastner et al, 2016).
Other managerial implication, developing from the current study have in reaction to service failures is the usage of apologies, which are not just anticipated by affected consumers, but are also advantageous in reinstating organizational reputation particularly in the context of service failure. Such a gratitude may enhance and enable the process of managerial decision-making comprising communication selections expected at strengthening relationships with consumers (Salvador et al., 2012). Moreover, the impact of recovery strategies on the revenue of the firm can be important and maintaining decent relationships with existing customers is a crucial strategy (Ozuem et al., 2017).

REFERENCES


Using a Quantified-Self App to Personalise Learning – A Comparison of Visualisations for the Evaluation of the Learning Process

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Abstract
The digitalisation of students’ lives leads to the almost ubiquitous use of apps for all parts of life. The digitalisation of university learning has led to many learning management systems in use in institutions of higher education. However, it has not quite kept up with the demand for highly flexible learning at all hours and in all locations. Learning apps are not used frequently by universities to improve students’ personalised learning. The paper reports on an app that combines self-regulated learning and the Quantified-Self approach to support such ubiquitous learning. When students track their learning in an app, they can later on benefit from the tracked data on an individual as well as aggregated level. Data analyses provide the potential for individual evaluation of the learning or comparison to peers. Thus, this study derives an extensive set of user stories for such app from the literature. Those user stories are the basis for evaluating the approach by turning them into visualisations that are then tested based on a mixed-method approach. The evaluation finds differences among the evaluated visualisations regarding ease of understanding, intuitive operations, visual appeal, and metacognition as well as potential for further improvement. From the findings an improved set of visualisations is generated and the results are fed back into the user stories.

Keywords: Personalised learning, self-regulated learning, quantified-self, visualisation, app design, mixed-methods

1.0 Introduction
Personalisation of learning regarding pace, content, and methods of the individual learners is usually performed by the teacher. However, with increasing class sizes and increasing degree of online learning especially in higher education, such personalisation becomes difficult. To encompass heterogeneity of the learners, self-regulated personalised learning provides a way to shift responsibility to the learners and enables them to personalise their learning themselves by selecting and using different learning tasks and tools in order to achieve the learning goals (Melzer, 2018). Self-regulated learning (SRL) provides the basis for such personalisation as it describes learning as a cyclic process encompassing (1) a preparatory phase, (2) a performance phase, and (3) an appraisal phase (Panadero, 2017). In addition to the core learning activity, the learners focus on observing and documenting their behaviour to provide a basis for reflecting and improving the learning. SRL can be performed using pen and paper for documentation; however, recent approaches combine self-regulated learning and Quantified-Self (Melzer, 2019; Neitzel & Rensing, 2017; Piotrkowicz et al., 2017). The Quantified-Self (QS) describes
a movement of tracking personal data (e.g. food consumption, sports) through wearables or mobile phones. The data gathered is used to deduce self-knowledge and improve individual behaviour. In the domain of self-regulated learning, such apps provide numerous benefits in terms of ubiquitous access to the data, powerful analyses, and individual recommendations. These benefits are of vital importance for app users, as they need to compensate the often cumbersome process of manual data tracking to increase reuse intention of the apps eventually. The app “Quantified-Self in E-Learning” (QSEL) (Melzer, Schneider & Schoop, 2018) as a good example for the above approach tracks learning sessions of students w.r.t. duration, place, lecture, topic, task, tool, and satisfaction.

The research goal of the current paper is to analyse how such app should visualise the data in order to benefit its users and increase reuse intention. Focusing primarily on the evaluation of the data, the following research questions will be investigated in the paper:

1. What are relevant user stories to transmit the benefits of such an app?
2. What are possible visualisations of these user stories?
3. What are evaluation criteria for those visualisations?

The research follows a design science approach (Baskerville & Pries-Heje, 2010) deriving user stories based on the literature. These user stories are then implemented as mock-ups showing potential visualisations of the gathered learning data. Finally, those visualisations are subject to exploratory evaluation adhering to a mixed-method approach. The contribution of this paper, therefore, can be seen in generalisable user stories (meta-requirements) to communicate the benefits of a QS app to the users as well as specific implementations of these user stories which are evaluated and in turn fed back into the user stories.

2.0 Background and Approach

Considering SRL in the context of higher education, the cyclic learning process can be applied with different levels of granularity. In the following, we will consider three levels of the SRL process (cf. Figure 1): the academic learning level (which starts with selecting a degree programme and ends when achieving the degree); the term-based learning level (which starts with choosing the courses for the particular term and ends with completing the exam for each of those courses); the session-based level (which is a fine-grained process covering one learning session and ends with a reflection of the learning outcome).

The three phases of the cyclic SRL process are composed of different categories (Zimmerman & Moylan, 2009) (cf. Figure 2), which relate to QS as follows. The preparatory phase includes the analysis of the task and self-motivational beliefs. In the performance phase, the learner
records his/her behaviour during self-observation and adjusts it based on tasks referred to as self-control. Afterwards, self-judgment and self-reacting include the comparison of the current performance with previous ones and the satisfaction with the performance. This has an impact on further iterations of the process. Based on the SRL process, user stories, which occur using a QS app in the context of learning, can now be developed (cf. Table 1) and be assigned to the learning levels (cf. Figure 1).

As one-time activities to use the app (registration, settings, etc.) are not related to that process, they are not considered. Looking at the composition of the first phase (preparatory phase), task analysis includes setting goals and decomposing tasks into concrete activities (cf. Figure 2), which can be supported using the app (cf. user story 1, Table 1). In contrast, self-motivation
beliefs are not related to a specific target; rather they are associated with beliefs or feelings, affecting the engagement in the performance phase (cf. Zimmerman & Moylan, 2009). Therefore, no user story captures self-motivation beliefs.

Self-observation (which is part of the performance phase) covers the task of self-recording, i.e. tracking the behaviour using a QS app; this is captured as user story 2 (cf. Table 1). Besides gathering information regarding the preparatory phase, this user story takes place following the performance phase of a process (cf. Figure 1). In the session-based learning level, session data (e.g. learning duration) is recorded; the term-based learning level captures exam grades; the academic learning level documents degrees, certificates, or badges.

User Story 1: User can track their learning objectives and related tasks to comply with and reflect on the plan prepared in the preparatory phase.
User Story 2: User can track their behaviour to self-observe their performance during learning.
User Story 3: User can evaluate their performance based on data from recent learning lesson to reflect and perform better next time.
User Story 4: User can evaluate their performance based on aggregated data to monitor the achievement of objectives and self-control their learning performance.
User Story 5: User can compare their performance to previous individual performances or peer performances to affect further preparation and appraisal phases.

Table 1. User Stories of a Quantified-Self learning app

Using that data, QS apps usually provide two views. For the case of QS sports apps, user can evaluate their steps on a daily basis as well as average values over certain time periods. For QS learning apps, user can evaluate their recent performance after tracking data (cf. user story 3, Table 1), which can be categorised as a part of the appraisal phase (cf. Figure 1). On the other hand, user data is aggregated over a longer period of time (cf. user story 4, Table 1). As each iteration of a process generates data (cf. user story 2), it is fed back in the performance phase of the higher-level process (cf. Figure 1). The collected data can be aggregated in that phase to self-control the learning and adapt further iterations of the lower level process. Applied to the context of learning, data (e.g. learning time) is captured at the end of each learning session and can be seen right after performing the learning; meanwhile, the data over several sessions can be aggregated (e.g. average learning time a day) across a term while learning sessions are
performed. Therefore, even if the aggregated analysis is assigned to the performance phase, it refers to the related appraisal phase and the preparatory phase of the next iteration.

Facing the appraisal phase, self-judgement includes the comparison of the learner’s performance with previous activities or the performance of other learners’ behaviour (cf. user story 5, Table 1), which can be implemented by visualising absolute as well as aggregated data (cf. Figure 1). Comparisons of the performance with fellow students can affect the appraisal and preparatory phase (Schumacher & Ifenthaler, 2018). Self-reacting is based on the learner’s satisfaction with the learning performance and adaptive decisions for further process cycles. As those activities are cognitive reactions (Zimmerman & Moylan, 2009) and cannot be assessed by statistical evaluations, they are not captured as a user story. Although the visualisation of learning data, which provides the user with objective information, can affect the subjective impression of a learner, this is more likely an overall goal of that task than a user story.

The five user stories illustrated in Table 1 are developed based on the theory of SRL and QS in learning/learning analytics in general. Facing the second research question (i.e. what are possible visualisations of these user stories), not all user stories are considered further. We decided to focus on the development of visualisations for user stories 3, 4, and 5 as they provide the highest potential for large and diverse data. User story 1, which refers to data gathered while planning (preparatory phase), and user story 2, which relates to the collection of data itself, are not included in proposing a concrete visualisation of a QS learning app through the example of QSEL.

The data collected by QSEL includes parameters regarding learning condition (location, duration, time, and type of breaks), personal condition before/after a learning session (mood, atmosphere, perceived productiveness, and concentration), and daily self-evaluation (sleep, food, sports). Data is gathered on two different occasions. Firstly, session-based data at the end of the performance phase is used. Secondly, term-based grades at the end of the performance phase are recorded. Subsequent to the performance phase of the academic learning level, no data is gathered within QSEL as the high-level process has only a few iterations (i.e. achieving a Bachelor and a Master degree). For the moment, QSEL focus on session-based and term-based data. Hence visualisations will focus on the learning data on session-based and term-based learning levels.

### 3.0 Visualisations

The visualisations were created by a project team of eight graduate students of information systems or management. Two design teams were formed and each developed visualisations of
the learning data, which easily enables the users to follow their learning process via graphical analyses.

In the following, the resulting eight screens, representing three different applications within the session-based and term-based learning levels are presented. Originally developed and evaluated in German, the visualisations were translated into English by the authors.

As the session-based learning level is the most detailed level considered, there is no data of lower process iterations which can be aggregated (cf. user story 3). Therefore, only an illustration of absolute data is possible (cf. Figure 3). Figure 3 presents the screen immediately following a completed learning session to provide feedback right after entering learning data. Both diagrams 1.1 and 2.1 show learning and break duration. Additionally, the data just gathered concerning learning environment and mood is shown and the learners receive information about their progress concerning the module.
The gathered session data of each iteration of the cyclical process is fed in the performance phase of the term-based learning level, where aggregated analysis can be provided (cf. user story 4).

Figure 4. Visualisation of aggregated session data: diagrams 1.2 and 1.3 from design team 1 (on the left) and diagrams 2.2 and 2.3 from design team 2 (on the right)

Figure 4 and Figure 5 contrast overall data, independent of a learning session and partially module-independent. Diagrams 1.2 and 2.2 compare learning duration and learning location with success versus average mood during the sessions, grouped by weekdays. Diagrams 1.3 and 2.3 provide details on the break activities.

Diagrams 1.4 and 2.4 compare one’s own learning duration across learning sessions of one module with the duration of fellow students. Diagrams 1.5 and 2.5 illustrate effective learning phases based on the learner’s perception, depending on personal constitution versus the time of day. Most of the diagrams of those screens offer to select different timeframes and abstraction levels regarding modules and others, which allows the learner to customise the visualisation.
At the end of the performance phase on the term-based learning level, data on grades is entered and can be checked during the appraisal phase (cf. user story 3), illustrated in Figure 6. Both design teams proposed to collect grades in addition to the current data, as it is the “best available measure of students’ actual learning outcome” (Ott, Robins, Haden, & Shephard, 2015, p. 177). Diagrams 1.6 and 2.6 provide a performance overview in comparison to fellow students whereas diagrams 1.7 and 2.7 show the grade in relation to the number of hours learned for the module exam. Especially diagrams 1.6 and 1.7 offer the additional benefit of comparing the result with the set goal (Duval, 2011; Schumacher & Ifenthaler, 2018).
The different diagrams are evaluated in the following to propose a final result as to how the visualisation of the learning data could be visualised for the purpose of learner support.

4.0 Evaluation

The visualisation shown above will be evaluated following a mixed-method approach aiming to compare the visualisation by design team 1 (i.e. diagrams 1.x) to those by design team 2 (i.e. diagrams 2.x).

The evaluation started with the qualitative part. Expert interviews were conducted to broaden the designers’ own view (particularly as they were graduate students). In parallel, a quantitative online survey was conducted to assess the quality of the visualisations with students as potential future users. Afterwards the results of both methods were integrated.
4.1 A Research Model for Visualisations of the Learning Process

As a theoretical basis for the evaluation, WebQual (Loiacono, Watson, & Goodhue, 2007) is used. WebQual is an adaptation of the Technology Acceptance Model (Davis, Bagozzi, & Warshaw, 1989) and other related theories especially for the evaluation of web-based systems. Based on the WebQual instrument, a diverse range of constructs can be analysed focusing on the concepts of usefulness, ease of use, and entertainment, which eventually increase reuse intention. As our study is concerned with the domain of learning, we decided to add the concept of perceived benefit to the model involving the constructs of metacognition and learning effectiveness (Nussbaumer, Hillemann, Gütl, & Albert, 2015). Using the combined research model depicted in Figure 7, this study evaluates the treatments regarding the different constructs proposed by WebQual.

![Research Model adapted from Loiacono et al. (2007) and Nussbaumer et al. (2015)](image)

4.2 Qualitative Interviews

The qualitative investigation was conducted as an expert evaluation of the visualisations. A diverse group of three experts in the fields of e-learning and usability engineering (interviewee 1), information design and innovative learning (interviewee 2), and app development (interviewee 3) could be acquired. Each of the participants is an active researcher and practitioner in their domain with several years of experience. A semi-structured interview was conducted with each of the experts asking them to evaluate the diagrams of both treatments. The interview guideline was derived from the research model to structure the questions. The interviews were recorded and transcribed for qualitative content analysis following an open coding approach. The goal of these interviews was to generate diverse feedback on the visualisations and concrete potential for further improvement. To reflect commonalities and
links among the codes, categories were generated from the coding. In a second step more
generalisable categories were developed which include one or more first-order codes,
classifying them thematically into thirteen second-order-themes. In the last step we identified
three core dimensions by abstracting the individual second-order-themes.

4.3 Quantitative Survey
For the quantitative evaluation, a survey was constructed based on the research model. Survey
items were adopted from the WebQual model (Loiacono et al., 2007) and from Nussbaumer et
al. (2015) translated into German to fit the target population and the domain of self-tracking in
the learning domain. Additionally, control variables were added regarding experience of the
participants using mobile devices and motivation (Gimpel, Nißen, & Görlitz, 2013). A total of
460 students participated in the online survey divided into 14 randomized treatment groups
(group size 30 – 37 participants), who each evaluated two to three visualisations separately.
They were required to fill in the survey over social media without any further incentive. 24
datasets had to be removed due to missing or inconclusive data leading to a final dataset of 436
participants.

5.0 Results
In the following, the results will be presented beginning with the interviews, followed by the
survey.

5.1 Expert Interviews
The open coding of the interviews led to the first-order categories, second-order categories, and
core dimensions shown in Figure 8.
The dimension change in behaviour consists of three underlying categories, namely
recommendations, goals and comparisons, which can induce a change in students’ learning
habits. The interviewees often request recommendations to improve the learning e.g.:
“[...] if you want people to use your app, you just have to offer the people a benefit. And
perhaps also offer such help as: when is it useful to take breaks? So you know when it
makes sense. So 30 minutes is e.g. a good time and then five minutes break and then work
again.” (Interviewee 2, translated from German by the authors)
Hereby the interviewees refer to the provision of recommendations which, on the one hand, are
based on theoretical findings (e.g. recommendations regarding sleep duration or the ratio of
learning and breaks) and, on the other hand, generated by analysing existing learning data.
Furthermore, setting goals and comparisons to other learners or to oneself can help to achieve a behavioural change. It must be noticed that according to the experts, comparisons can lead to either positive or negative behavioural changes in a way that learners tend to get motivated or also discouraged if there are e.g. large discrepancies between one’s own performance and that of others.

Figure 8. Results of the interviews

<table>
<thead>
<tr>
<th>First-Order Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommendations based on theoretical concepts</td>
</tr>
<tr>
<td>Recommendations based on existing learning data</td>
</tr>
<tr>
<td>Setting own goals</td>
</tr>
<tr>
<td>Information when goals are achieved</td>
</tr>
<tr>
<td>Positive consequences of comparison</td>
</tr>
<tr>
<td>Negative consequences of comparison</td>
</tr>
<tr>
<td>Different preferences dependent on type of user</td>
</tr>
<tr>
<td>Choice between different diagrams or screens</td>
</tr>
<tr>
<td>Click on elements to gain more information</td>
</tr>
<tr>
<td>Large labels and letters</td>
</tr>
<tr>
<td>Understandable captions and symbols</td>
</tr>
<tr>
<td>Walkthroughs or tutorials</td>
</tr>
<tr>
<td>Interpretive aid</td>
</tr>
<tr>
<td>Use of same colours/ patterns for same content</td>
</tr>
<tr>
<td>Use of same symbols for same content</td>
</tr>
<tr>
<td>Easy operation, also for inexperienced users</td>
</tr>
<tr>
<td>The diagram should fit to the content</td>
</tr>
<tr>
<td>Content should be informative for the learner</td>
</tr>
<tr>
<td>Only meaningful matching of data</td>
</tr>
<tr>
<td>Too much information can be confusing</td>
</tr>
<tr>
<td>Too less information is not helpful</td>
</tr>
<tr>
<td>Advantage of using the visualisation compared to regular learning methods</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Second-Order Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommendation</td>
</tr>
<tr>
<td>Goals</td>
</tr>
<tr>
<td>Comparison</td>
</tr>
<tr>
<td>Personalisation</td>
</tr>
<tr>
<td>Interactivity</td>
</tr>
<tr>
<td>Readability</td>
</tr>
<tr>
<td>Instructions</td>
</tr>
<tr>
<td>Consistence</td>
</tr>
<tr>
<td>Intuition</td>
</tr>
<tr>
<td>Form of Presentation</td>
</tr>
<tr>
<td>Content</td>
</tr>
<tr>
<td>Level of Detail</td>
</tr>
<tr>
<td>Added Value</td>
</tr>
</tbody>
</table>

Core Dimensions

- Change in Behaviour
- Usability
- Informational Value

The usability dimension to which the visualisations belong contains personalisation, i.e. it should be possible to customise the data according to personal preferences.

Moreover, readability in terms of large labels such as understandable captions, symbols and instructions such as tutorials or interpretive aids are mentioned. A consistent design is deemed to ensure e.g. a uniform use of colours or symbols and to support an intuitive operation (intuition) are important aspects, too.

The third core dimension, i.e. informational value, focuses on the data used. According to the respondents it is essential to choose a form of presentation which is adequate to the content conveyed otherwise information could get distorted or lost.

Moreover, only a meaningful matching of the available data leads to useful content which can be informative for the learner. The presented content can vary in its level of detail. Hereby, it is important to choose an adequate depth of information within the continuum of providing enough information and being stressed by too much information. This also alludes to the category added value which is the benefit a learner receives by using the visualised data.
“[…] because I just get the same data displayed differently. There the advantage of the app to paper is surely huge.” (Interviewee 1, translated from German by the authors)

Comparing the treatments to each other, the interviewees had different opinions. Interviewee 1 generally rated diagrams 2.x higher due to his perception of a more intuitive design. Only for the visualisation of session data (cf. Figure 3) he preferred treatments 1.1 and 1.2 because of the higher informational content. In contrast, the second interviewee, preferred the first four diagrams of treatment 1, as he put more emphasis on the amount of the provided information which is higher in those. Nevertheless, he noted that these visualisations would need further instructions. The last three visualisations and especially the grading scale of treatment 2 (Figure 6, diagram 2.6) were preferred by this expert as they are much more intuitive and offer higher benefit to learners. In contrast, the third interviewee preferred the grading scale of treatment 1 (Figure 6, diagram 1.6) due to the higher amount of content. However, the third expert did not favour one treatment in total and often had different favourites. Summing up, we can say that the experts had different opinions concerning the treatments and diagrams and, therefore, had different preferences. Table 2 provides a summary of advantages and disadvantages reported by the interviewees.

<table>
<thead>
<tr>
<th>Diagram</th>
<th>Treatment 1</th>
<th>Treatment 2</th>
</tr>
</thead>
</table>
| 1       | + More information  
+ More intuitive  
- Explanation required |  |
| 2       | + More intuitive  
- Explanation required | + More intuitive |
| 3       | + More intuitive  
- Explanation required | + More intuitive |
| 4       | + More intuitive  
- Explanation required | + More intuitive |
| 5       |  | + More intuitive  
+ High perceived benefit |
| 6       |  | + More intuitive  
+ High perceived benefit |
| 7       |  | + More intuitive  
+ High perceived benefit |

Table 2. Advantages and disadvantages of the visualisations retrieved from the interviews.
5.2 User Survey
The data collected from the user survey include 57.6% females and 42.4% male students. The sample exhibits an average age of 23.9 (SD=3.32) years. Participants were mostly German students with 5% international students in the sample being enrolled in a Bachelor (52%) or Master (44.8%) programme. Participants revealed mediocre experience with self-tracking (M=4.56, SD=1.52). The randomised generation of treatment groups lead to treatment 1 having a significantly higher experience compared to treatment 2 (M(T1)=4.781, M(T2)=4.404, t(422)=-2.615, p=0.009, r=0.126). The remaining control variables self-entertainment, self-design, and self-discipline showed no effects on the treatment groups.

While most constructs produce acceptable results regarding Cronbach’s alpha being between 0.800 and 0.930, learning effectiveness has to be discarded due to conflicting items (Nunnally & Bernstein, 1994). Over all visualisations, the constructs relative advantage, ease of understanding, and intuitive operations are rated the highest, while info/fit-to-task, tailored information, and innovativeness are rated the lowest (cf. Table 3).

<table>
<thead>
<tr>
<th>No. of Items</th>
<th>Construct</th>
<th>Cronbach’s Alpha</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Info/Fit-to-Task</td>
<td>0.828</td>
<td>5.03</td>
<td>1.18</td>
</tr>
<tr>
<td>3</td>
<td>Tailored Information</td>
<td>0.851</td>
<td>4.83</td>
<td>1.20</td>
</tr>
<tr>
<td>3</td>
<td>Relative Advantage</td>
<td>0.865</td>
<td>5.75</td>
<td>1.18</td>
</tr>
<tr>
<td>3</td>
<td>Ease of Understanding</td>
<td>0.8973</td>
<td>5.74</td>
<td>1.10</td>
</tr>
<tr>
<td>3</td>
<td>Intuitive Operations</td>
<td>0.850</td>
<td>5.64</td>
<td>1.04</td>
</tr>
<tr>
<td>3</td>
<td>Visual Appeal</td>
<td>0.930</td>
<td>5.45</td>
<td>1.27</td>
</tr>
<tr>
<td>3</td>
<td>Innovativeness</td>
<td>0.874</td>
<td>4.74</td>
<td>1.29</td>
</tr>
<tr>
<td>3</td>
<td>Consistent Image</td>
<td>0.881</td>
<td>5.33</td>
<td>1.12</td>
</tr>
<tr>
<td>2</td>
<td>Metacognition</td>
<td>0.800</td>
<td>5.12</td>
<td>1.27</td>
</tr>
<tr>
<td>2</td>
<td>Learning Effectiveness</td>
<td>-1.421</td>
<td>4.21</td>
<td>0.83</td>
</tr>
</tbody>
</table>

Table 3. Validity and descriptives over all visualisations. All items measured on a 7-point Likert scale from 1 “totally disagree” over 4 “neutral” to 7 “totally agree” (N=436).

Figure 9 reports the mean values per criterium and diagram separately (low values in red, high values in green). It confirms, that treatment 2 is on average higher rated than treatment 1. While
this effect is mainly visible for info/fit-to-task (e.g. diagrams 1.1., 1.3, 1.5.), regarding the criterium of tailored information is only met by diagram 1.7. For diagram 1.5, rather low means are reported for the criteria ease of understanding, intuitive operations, visual appeal, and consistent image. Regarding innovativeness, low means are observed in general, only seeing an exception for diagram 1.7 having a mediocre value. Finally, regarding metacognition good values are observed for diagrams 1.7 and 2.2., while the lowest mean is observed for diagram 1.3.

<table>
<thead>
<tr>
<th>Diagram</th>
<th>N</th>
<th>Info/Fit-to-task</th>
<th>Tailored Information</th>
<th>Relative Advantage</th>
<th>Ease of Understanding</th>
<th>Intuitive Operations</th>
<th>Visual Appeal</th>
<th>Innovativeness</th>
<th>Consistent Image</th>
<th>Metacognition</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>30</td>
<td>4.722</td>
<td>4.744</td>
<td>5.758</td>
<td>5.911</td>
<td>5.722</td>
<td>5.695</td>
<td>4.377</td>
<td>5.267</td>
<td>5.087</td>
<td>5.246</td>
</tr>
<tr>
<td>1.2</td>
<td>30</td>
<td>4.871</td>
<td>4.644</td>
<td>5.076</td>
<td>5.333</td>
<td>5.653</td>
<td>5.089</td>
<td>4.880</td>
<td>5.022</td>
<td>4.933</td>
<td>5.092</td>
</tr>
<tr>
<td>1.3</td>
<td>30</td>
<td>4.589</td>
<td>4.444</td>
<td>5.077</td>
<td>5.777</td>
<td>5.777</td>
<td>5.777</td>
<td>4.333</td>
<td>5.033</td>
<td>4.427</td>
<td>5.137</td>
</tr>
<tr>
<td>1.4</td>
<td>30</td>
<td>4.922</td>
<td>4.922</td>
<td>5.873</td>
<td>5.600</td>
<td>5.633</td>
<td>5.100</td>
<td>4.435</td>
<td>5.122</td>
<td>5.100</td>
<td>5.204</td>
</tr>
<tr>
<td>1.6</td>
<td>30</td>
<td>5.000</td>
<td>5.311</td>
<td>6.089</td>
<td>5.456</td>
<td>5.444</td>
<td>5.000</td>
<td>5.267</td>
<td>5.267</td>
<td>5.267</td>
<td>5.267</td>
</tr>
<tr>
<td>1.7</td>
<td>30</td>
<td>5.100</td>
<td>5.155</td>
<td>5.644</td>
<td>5.733</td>
<td>5.647</td>
<td>5.167</td>
<td>5.111</td>
<td>5.567</td>
<td>5.567</td>
<td>5.567</td>
</tr>
<tr>
<td>2.1</td>
<td>31</td>
<td>5.110</td>
<td>4.726</td>
<td>5.840</td>
<td>5.816</td>
<td>5.842</td>
<td>5.817</td>
<td>6.006</td>
<td>5.602</td>
<td>5.134</td>
<td>5.578</td>
</tr>
<tr>
<td>2.2</td>
<td>31</td>
<td>5.111</td>
<td>5.039</td>
<td>5.688</td>
<td>5.764</td>
<td>5.685</td>
<td>5.559</td>
<td>4.698</td>
<td>5.167</td>
<td>5.693</td>
<td>5.443</td>
</tr>
<tr>
<td>2.3</td>
<td>31</td>
<td>4.677</td>
<td>4.835</td>
<td>5.680</td>
<td>5.764</td>
<td>5.685</td>
<td>5.649</td>
<td>4.455</td>
<td>5.170</td>
<td>5.170</td>
<td>5.170</td>
</tr>
<tr>
<td>2.4</td>
<td>31</td>
<td>4.960</td>
<td>4.470</td>
<td>5.098</td>
<td>5.892</td>
<td>5.737</td>
<td>5.491</td>
<td>4.582</td>
<td>5.313</td>
<td>5.094</td>
<td>5.277</td>
</tr>
<tr>
<td>2.5</td>
<td>31</td>
<td>5.119</td>
<td>5.000</td>
<td>5.798</td>
<td>5.612</td>
<td>5.797</td>
<td>5.484</td>
<td>4.688</td>
<td>5.424</td>
<td>5.300</td>
<td>5.364</td>
</tr>
<tr>
<td>2.6</td>
<td>31</td>
<td>5.120</td>
<td>4.726</td>
<td>5.771</td>
<td>6.121</td>
<td>5.890</td>
<td>5.773</td>
<td>4.545</td>
<td>5.723</td>
<td>4.878</td>
<td>5.406</td>
</tr>
<tr>
<td>2.7</td>
<td>31</td>
<td>5.123</td>
<td>5.046</td>
<td>5.840</td>
<td>5.734</td>
<td>5.706</td>
<td>5.522</td>
<td>5.090</td>
<td>5.509</td>
<td>5.316</td>
<td>5.474</td>
</tr>
</tbody>
</table>

Figure 9. Mean values for WebQual criteria per diagram

To compare the created treatments a one-way ANOVA is performed. The analysis shows significant effects from the treatments regarding ease of understanding (F(13, 422)=2.220, p=0.008, ω=0.035), intuitive operations (F(13, 422)=2.404, p=0.004, ω=0.040), visual appeal (F(13, 422)=1.906, p=0.028, ω=0.026), and metacognition (F(13, 422)=2.031, p=0.017, ω=0.030), while no differences can be found for info/fit-to-task, tailored information, relative advantage, and innovativeness.

As a follow-up analysis, contrasts are defined to compare especially those diagrams with each other, which display the same contents. For ease of understanding, diagrams 2.5 (M(T1)=5.078, M(T2)=5.616, t(422)=1.970, p=0.049, r=0.095) and 2.6 (M(T1)=5.456, M(T2)=6.121, t(422)=2.436, p=0.015, r=0.118) are evaluated significantly better compared to the corresponding diagrams of treatment 1. A similar effect can be shown regarding intuitive operations, where diagram 2.5 is again evaluated superior (M(T1)=4.811, M(T2)=5.717, t(422)=3.098, p=0.003, r=0.416) whilst diagram 2.6 is evaluated considerably better for visual appeal (M(T1)=5.000, M(T2)=5.727, t(422)=2.280, p=0.027, r=0.304). Finally, regarding metacognition, diagrams 2.2 (M(T1)=4.983, M(T2)=5.694, t(422)=2.208, p=0.028, r=0.107) and 2.3 (M(T1)=4.417, M(T2)=5.129, t(422)=2.215, p=0.027, r=0.107) are evaluated significantly higher compared to their counterparts from treatment 1. While the control variables mainly do not exert effects on the treatment groups, a small significant effect is revealing that participants evaluating diagrams 1.4, 1.5, 1.6, and 1.7 had a higher self-discipline
than their counterparts in treatment 2 (M(T1)=5.622, M(T2)=4.922, t(52.662)=-2.134, p=0.038, r=0.282). The results are summarised in Table 4.

<table>
<thead>
<tr>
<th>Diagram</th>
<th>Treatment 1</th>
<th>Treatment 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>M_metacognition=4.983*</td>
<td>M_metacognition=5.694*</td>
</tr>
<tr>
<td>3</td>
<td>M_metacognition=4.417*</td>
<td>M_metacognition=5.129*</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>M_ease_of_understanding=5.077*</td>
<td>M_ease_of_understanding=5.616*</td>
</tr>
<tr>
<td></td>
<td>M_intuitive_operations=4.811**</td>
<td>M_intuitive_operations=5.717**</td>
</tr>
<tr>
<td>6</td>
<td>M_ease_of_understanding=5.456*</td>
<td>M_ease_of_understanding=6.121*</td>
</tr>
<tr>
<td></td>
<td>M_visual_appeal=5.000*</td>
<td>M_visual_appeal=5.727*</td>
</tr>
<tr>
<td>7</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 4. Comparisons between treatments **p<0.01, *p<0.05

6.0 Discussion

In the following section, the results from the qualitative as well as from the quantitative data analysis are summarised and combined. On the one hand, the survey participants (as potential future users of the app) rate the visualisations in general to be rather easy to understand, intuitive to operate, and eventually providing a relative advantage for them. This is consistent to the interviewees, which find the diagrams mostly informative and intuitive. Contrasting the easiness to understand the diagrams, the interviewees requested further explanation for some of them. On the other hand, they rate learning effectiveness, innovativeness, and tailored information to be low. While the low rating of learning effectiveness might be due to low validity of the measurement items (cf. Table 3), low innovativeness and tailored information are consistent to the feedback obtained in the interviews. Interviewees suggested improving the diagrams including tooltips as well as the possibility for customisation (e.g. selecting variables and dimensions to visualise dynamically), which offers additional benefit to the user (cf. Duval, 2011; Keim, 2002).
Comparing the treatments, the interviewees favoured diagrams 1 – 4 of treatment 1 and diagrams 5 – 7 of treatment 2, albeit discussing different advantage and disadvantages (cf. Table 5). However, survey participants did not confirm this result, as they rather favoured treatment 2 (especially diagrams 2, 3, 5, 6) over treatment 1. While diagrams 2.2 and 2.3, showing aggregated session data, were favoured due to higher potential for metacognition, diagrams 2.5 and 2.6, showing aggregated term-based data, were preferred due to their ease of understanding, intuitive operations, and visual appeal. Differing results might be explained by the possibility of the interviewees to ask for an explanation of the diagrams, more time to assess the diagrams, as well as high expertise in related areas. Nevertheless, combining those findings, a stable trend could be formulated, that diagram 1.1 is slightly dominating its counterpart. Regarding absolute session data, users obviously favour as much information as possible. Diagrams 2-4 provide more information and, thus, more benefit to the users, however they are harder to understand, while the diagrams 2.5 – 2.7 are equally informative but more intuitive than their counterparts. In general, research question 3 can be answered, as the chosen criteria for the evaluation of the visualisations were useful and provided a valid and precise measure, except learning effectiveness, which suffered from low validity.
Combining the results of the qualitative and quantitative data analyses and improvements stated in the interviews the consolidated visualisations depicted in Figure 10 and Figure 11 have been developed in order to answer research question 2. Based on those diagrams which were favoured by the survey participants, improvements of the interviewees have been implemented, highlighted in red. Thus, the visualisations were extended by filtering features to select specific variables and dimensions to be visualised, as well as providing tooltips and guidance to the users. Furthermore, an additional visualisation (cf. Figure 12) is added, providing a list of frequently accessed analyses and diagrams to the users to add favourite visualisations.
Finally, answering research question 1, the results from evaluating the visualisations can be generalised towards the formulated user stories. As stated in the interviews, the visualisations provided the possibility for goal-setting and evaluation on the basis of individual as well as peer-based comparisons. The visualisations are found to provide the necessary benefits to induce the change in behaviour required for the quantified-self.

This study is subject to several limitations. First of all, extensive data analysis of the survey data revealed problems with data quality, indicated by low discriminant validity between the constructs. This may be due to the missing incentives for survey participants and the broad distribution of the survey over social media. Despite the large sample size, the data does not fulfil constraints to perform more complex analyses such as confirmatory factor analysis or structural equation modelling. Furthermore, the construct learning effectiveness had to be removed from descriptive analyses.
Figure 12. Additional visualisation to choose favourite visualisations

The control variables (experience, self-discipline, self-design, and self-reflection) have been asked for after the participants had evaluated their mock-ups. Thus, we cannot rule out that the treatments have an effect on the control variables. Therefore, they to be interpreted with great care.

The next research step will be the thorough implementation of the visualisations based on the evaluation for extensive field testing. As the research introduced in the current paper was performed by a project group of eight Master students, both the implementation of alternatives, the planning of a large roll-out for testing purposes, and the conduct and analyses of the tests will be the subject of various Master theses and PhD research.

References


Abstract

Filter bubble has considered as a serious risk for democracy and freedom of information on the internet and social media. This phenomenon can restrict users' access to information sources outside their comfort zone and increase the risk of polarisation of opinions on different topics. This in-progress paper explains our plan for conducting a prescriptive research aiming at decreasing the chance of filter bubbles formation on social networks. The paper explains a gap in the literature which is a prescriptive work considering both human and technology perspectives. To focus on this research gap, a design perspective has been selected covering two different bodies of theory as kernel theories. The paper explains the relevance of these theories, some of the primarily formed requirements derived from them and the future steps in this research. The explained future steps includes various phases of developing an Information Systems Design Theory and our strategy to evaluate the effectiveness of the developed theory.

Keywords: Filter Bubble, Information Bubble, Design Theory, Habermas Theory of Discourse, Attitude Polarisation.

1.0 Introduction

The concept of filter bubble (also known as information bubble) was first coined by the internet activist, Eli Pariser in a book with the same title (Pariser, 2011). This concept refers to the impact of our preferences and desires on the content and results we view on search engines, social media, and other online platforms. Significant attention in both academia and industry has been attracted to this notion since its development. In particular, the potential risk to narrow the information sources for online users and "pushing users into the psychological comfort zone of self-confirmation and risking polarisation on a societal level" have been mentioned in the literature (Courtois, Slechten, and Coenen, 2018, p. 2008).

Earlier literature on filter bubble, are mainly focused on the role of recommendation systems and how understanding users' information and preferences may impact the results they view on search engines (Hannak et al., 2013; Ridgway, 2017; Tran and Yerbury, 2015). Also, our review of the literature indicates that previous research work is either descriptive (Bozdag, Gao, Houben, and Warnier, 2014; Courtois et al., 2018; Matt, Benlian, Hess, and Weiß, 2014) or focused on technical improvements of related recommendation algorithms (Apel, Yom-Tov, and Tennenholtz, 2018; Knijnenburg, Sivakumar, and Wilkinson, 2016; Nguyen, Hui, Harper, Terveen, and Konstan, 2014).
This study, however, undertakes a different perspective and focuses on the reciprocal role of human and technology in creating such a bubble. The study also, takes a design perspective to prescribe an Information Systems Design Theory (ISDT) decreasing the chance of forming a filter bubble for users of social networks. To do this, the study refers to various theoretical bodies of research as kernel theories; to explore the role of technology, the study focuses on Habermas Theory of Discourse (Habermas, 2005), and to discover human behaviour, Attitude Polarisation (Corner, Whitmarsh, and Xenias, 2012) has been selected as a theoretical basis. The remainder of this paper, in sections 2, reviews the related literature and tries to position the current study within the body of research. Section 3 explains the used research methods including the kernel theories and how we are going to incorporate those theoretical concepts in our design research. Section 4 explains our primarily outcomes including a number of design requirements and explains our plan for future research in forming and evaluating the design theory.

2.0 Filter bubble

Shortly after the development of the term filter bubble, the concept found its way to academic research. Initial research in this area was mainly focused on verifying the existence of the filter bubble (Hannak et al., 2013) and its impact (Forsblom, Nurmi, Åman, and Liikkanen, 2012). Several negative impacts are associated with filter bubbles in the literature. Taramigkou, Bothos, Christidis, Apostolou, and Mentzas (2013) mentioned that developing filter bubbles in music platforms makes it difficult for users to go out of their personalised world and change their taste and opinion. Also, proliferation of fake news has been considered as a possible consequence of filter bubbles (Bhatt, Joglekar, Bano, and Sastry, 2018; Seargeant and Tagg, 2018) as this make entrance of new information hard into the developed bubble. Other potential negative impacts include decline in user trust (Nagulendra and Vassileva, 2016), limiting people's access to information (Valdez, Kluge, and Ziefle, 2018), and social fragmentation (Möller, Trilling, Helberger, and van Es, 2018).

In particular, polarisation of political discussions in social media has been cited as a major consequence which may happen when people are trapped in a bubble that prevents them from receiving outsider information (Foth, Tomitsch, Forlano, Haeusler, and Satchell, 2016; Lahoti, Garimella, and Gionis, 2018; Quraishi, Fafalios,
and Herder, 2018; Thonet, Cabanac, Boughanem, and Pinel-Sauvagnat, 2017). Network studies (Kelly and Francios, 2018) illustrate how Twitter groups do not extend political discourse but isolate factions in self-confirming chatter. Although exposure to opposite political view is not approved to significantly impact (or change) people's political opinion (Bail et al., 2018), this could be a risk to diversity of opinions; and well-functioning democracy as a result (Bozdag and van den Hoven, 2015; Dylko et al., 2018).

The initial work on filter bubble mainly focuses on the impact of recommendation systems (LR, Tamhane, and Pervin, 2018; Nguyen et al., 2014; Sanz-Cruzado and Castells, 2018). This perspective, which is similar to the initial description of Pariser (2011) about the topic, considers the use of user's demographic information, history, and search behaviour in suggesting new content by social media and search engines, as the main factor which creates filter bubbles. However, this perspective has been increasingly challenged by recent research studies in this area (Garrett, 2017). For example, a study on Facebook content found that only 5-8% of the content provided to people with various political viewpoints is based on their profile (E. Bakshy, S. Messing, and L. A. Adamic, 2015). Companies such as Facebook and Google have also claimed to improve their algorithms to avoid the impacts of filter bubble (E. Bakshy, S. Messing, and L. Adamic, 2015; Hao, 2018).

On the other hand, recent studies are more focused on the role of social media users (rather than technologies). For example, the study of Möller et al. (2018) shows a match between news recommendation systems and journalistic recommendations. The study concludes that future research should focus on factors other than recommendation algorithms to achieve diversity. Following this call, in the current study we shift the focus to human aspects of social networks and how the provided features in the social networks enable users to create a filter bubble around them.

### 3.0 Research Method

The current research will use a process model for design science research suggested by Peffers, Tuunanen, Rothenberger, and Chatterjee (2007). The research design process starts with problem and motive identification and continues with defining objectives of a solution. In this research a solution will be converted to an artefact during the design and development phase.
Considering the prescriptive nature of this study a developed Information Systems Design Theory (ISDT) is selected as the output. This ISDT will entail the structure and function of an information system and a process facilitating the implementation of the first component which can respectively represented by the principles of form and function and principles of implementation in ISDT according to Gregor and Jones (2007).

Requirements in ISDT are governed by core theories from natural or social science areas known as kernel theories (Walls, Widermeyer, and El Sawy, 2004). As explained before, the twofold nature of this study in considering both human and technology aspects of the filter bubble, will be reflected in the selected kernel theories. Habermas theory of discourse has been set as product kernel theory to explain the architecture of the required information systems and Attitude Polarisation is selected as process kernel theory to explain the behavioural aspects.

3.1 Habermas Theory of Discourse

Habermas identifies discourse as “a processes of argumentation and dialogue in which the claims implicit in the speech act are tested for their rational justifiability as true, correct or authentic” and can coordinate human actions (Bohman and Rehg, 2007, p. Section 3.1). In the current study, the ideal (free from filter bubble) social network is considered as an ideal form of discourse. Aier, Fischer, and Winter (2011) interpretation of discourse theory identifies four pragmatic presuppositions of an ideal discourse which are listed below:

- No-one capable of making a relevant contribution has been excluded.
- Participants have equal voice.
- Participants are internally free to speak their honest opinion without deception or self-deception.
- There is no source of coercion built into the process and procedures of discourse.

Considering the above presuppositions, in the study will help the research to form the requirements in a way that they decrease the gap between the developed system and an ideal discourse.

3.2 Attitude Polarisation

According to Corner et al. (2012, p. 6), attitude polarisation refers to the fact that "having assimilated information in a biased way, people with opposing attitudes may diverge in their opinions". The reason this has been selected as a kernel theory for the
current study is to consider the most significant impact of filtered information in the social network and how it can lead to polarisation of people on various aspects.

Previous studies has investigated the impact of attitude polarisation on social networks like Facebook (Howarth and Sharman, 2015) and Twitter (Pearce, Holmberg, Hellsten, and Nerlich, 2014) and how these social networks are divided on topics such as climate change and politics.

In this study, we will particularly consider the interpretation of Parsell (2008) about the concept of attitude polarisation in the context of internet and web 2.0:

- People seek out others with the same prejudices as themselves;
- The Web 2.0 provides the necessary resources to build communities with whomever we like;
- Being in a community of people with the same prejudices increases our own prejudices;
- Hence, the Web 2.0 is likely to lead to greater prejudice, social cleavage and community division.

The developed requirements for the ISDT are set to help avoid these "worrying argument".

### 4.0 Future work

#### 4.1 Design theory

The developed ISDT in this study will be a macro-level design theory that satisfies a number of design requirements for avoiding filter bubble in social networks. These requirements will be derived from kernel theories and include the following:

- Informing users about the concept of filter bubble on social networks and its negative impacts.
- Informing users from potential and actual filter bubbles in the content they view.
- Facilitating exploration of different (and opposing) viewpoints on certain topics (i.e. hashtags).
- Reminding users about the possibility of forming an filter bubble when they block or mute users outside their comfort zone.

By referring to two main references of ISDT, Table 1 explains how requirements of an ISDT will be met in the current study.

<table>
<thead>
<tr>
<th>Requirements of ISDT</th>
<th>How the requirement will be met in the current study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elements of ISDT (Walls, Widmeyer, and El Sawy, 1992)</td>
<td>Anatomical skeleton of design theory (Gregor and Jones, 2007)</td>
</tr>
<tr>
<td></td>
<td>Habermas’ theory of discourse will be used to form the technology related requirements</td>
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<tr>
<td>Product kernel theory</td>
<td>Justificatory knowledge</td>
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<tr>
<td>Process kernel theory</td>
<td>Attitude Polarisation will be used to form the human related requirements</td>
</tr>
<tr>
<td>Meta-requirements</td>
<td>Purpose and scope</td>
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<td>Requirements of ISDT</td>
<td>How the requirement will be met in the current study</td>
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<tr>
<td>Meta-description</td>
<td>Principle of form and function</td>
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<td>Artefact mutability</td>
<td>Testable propositions</td>
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<tr>
<td>Product hypotheses</td>
<td>Testable propositions</td>
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<tr>
<td>Process hypotheses</td>
<td>Testable propositions</td>
</tr>
<tr>
<td>Design method</td>
<td>Principles of implementation</td>
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Table 1. Components of design theory in the current study

4.2 Implementation and evaluation
Artefact evaluation has been considered as a crucial phase in design research (Hevner, March, Park, and Ram, 2004; Peffers et al., 2007). For this reason, the developed design principles will be implemented and evaluated in a social network. Both ex ante and ex post evaluations will be subject of attention in this study. Ex ante evaluation is the predictive evaluation of the design effort with respect to the future impacts. This will be done through surveying experts in areas such as social networks and ethics about the developed ISDT. On the other hand, ex post evaluation evaluates functional value of a developed artefact (Neff et al., 2014; Stefanou, 2001). Ex post evaluation in this study will be through implementation of the principles in real social network environment and formally evaluate their impact in avoiding filter bubbles.

5. Conclusions
Filter bubbles are problematic because they create barriers to rational discussion and the dialogue that is necessary for a democratic society. This research considers how the application of design science techniques in information systems might contribute to enable social media users to increase their awareness of filter bubbles and seek to avoid being trapped in them. However, this is a social issue because no-one has to be trapped in a filter bubble. Users can seek out different opinions, join different political
Twitter threads, and contribute to dialogs. And yet often users do not challenge their own social media tastes.

In exploring this area and considering both discourse and polarisation, we will need to query the motives which result in people remaining in filter bubbles. For some, perhaps, restriction to a filter bubble, is motivated by their perception of their identity within a group and their wish to remain in the perceived safety of a social bubble. When some move to other social groupings in, for example, Twitter, there may be a propensity, rather than entering to the social discourse envisioned by Habermas, to participating in the trolling, sarcasm and denigration that is so prevalent in social networks.

References


Abstract

Today’s widespread use of camera-equipped smartphones means that anyone may easily be filmed in public, and - through social media - exposed to a large audience whilst conducting their daily work. Police officers belong to an occupation that frequently has to encounter this situation. The police is a public authority with a broad societal mission aimed at reducing crime and increasing security in society, but is also entitled to make use of force at work. The latter is a fact that places high demands on them to organize and conduct their work in accordance with applicable laws and guidelines to ensure legal security for citizens, and to provide transparency and accountability. We intend to investigate what consequences citizens’ use of this wearable technology with built in cameras have on police officers’ individual practices. This research in progress paper will therefore address the question: How do police perceive citizens’ use of cameras to document them while conducting work? To answer the question, we conducted a qualitative study using the Swedish Police as a case, where in-depth interviews with police officers constitute the main data source. Theoretically, we draw upon on research on technological affordances, accountability, surveillance and sousveillance.

Keywords: wearable technology, camera, mobile phone, police, surveillance, sousveillance, social media
1. Introduction

With the widespread use of camera-equipped smartphones, surveillance is instant and in every person’s hand enabling citizens to take photos or videos of current events and, through social media, immediately make these available to a very large audience. This is one of the consequences of the ubiquitous or pervasive spread of a new digital infrastructure, allowing everyone to document everything and easily share it (Sörensen, 2010). Police officers belong to an occupation that frequently have to encounter this development. Citizens’ surveillance of the police has been defined as form of sousveillance (Mann et al., 2003; Mann & Ferenbook, 2013) and when the police are conducting activities to disturb being filmed could be described as counter-sousveillance (Lyon, 2015). We draw on the police in Sweden as a case allowing us to generate more knowledge about how the police respond towards being filmed by the public. The police is a public authority with a broad societal mission aimed at reducing crime and increasing security in society, but is also entitled to make use of force at work. The latter is a fact that places high demands on them to organize and conduct their work in accordance with legitimacy and rule of law, to ensure legal security for citizens, and to provide transparency and accountability. In this research in progress paper we set out to investigate police officers as one of the occupational groups that are exposed to this phenomenon where they need to consider the fact that citizens also engage in surveying them (with their smartphones etc) as representatives of an authority (Lippert & Newell, 2016).

This current technological development forces professionals in many parts of the public sector to face and reflect upon specific concerns. While exploring new digital opportunities to enhance transparency and public trust, they have to tackle risks associated with acting in public. As new practices emerge, an increasing range of considerations associated with the new digital technology is also becoming an integrated part of their daily work.

We focus on how this ever present potential, and the spread of wearable digital technologies like smartphones, provide both opportunities and constraints in officers’ work practices and how the police due to these potentials try to manage and organise their practices in a legitimate manner. Legitimacy and accountability in relation to both their own organisation and the citizens are then seen as components that are always relevant to public authorities. However, due to extensive demands on how to represent both their specific authority and societal democratic principles (with force if necessary) such legitimacy concerns emerge as particularly evident in the case of the police.

These are all different expectations, implying that the consequences that the citizens’ camera usage have on officers’ work practices needs to be empirically investigated. It has also been argued that police officers learn how to adapt their behaviour to any situation where there is a risk of being filmed by conducting ‘camera friendly work’ (Sandhu, 2016), which takes the shape of strategies aiming at controlling how they are perceived by different people and officers filming them or looking at the films. We therefore intend to empirically investigate what consequences this technology have on individual officers organising their own practices. This research in progress paper will therefore address the following research question: How do police officers perceive citizens’ use of cameras to document them while conducting work? To investigate the research question, we applied a qualitative study using the Swedish Police as a case, where interviews with 17 police officers have been conducted. Theoretically we draw upon research on technological affordances, accountability and surveillance.
2. Theoretical background

**Technological affordance**

Technological affordance and organisational accountability are concepts that are central to the analysis to be conducted in this study. We approach the involved wearable digital technology as a socially defined materiality (Orlikowski & Scott, 2008), holding certain features that promotes potential affordances (Gibson, 1979). The term affordance was coined by Gibson (1979) as a concept to understand how a certain environment enables opportunities for actions. The same environment can afford quite different opportunities depending on the individual. Affordance therefore refers to the specific interaction between an actor and the environment. The potential possibilities in a specific environment are thus different for different individuals (Taylor, 2014). In this study we use the concept of affordance to understand how the technology and digital infrastructure enables or constrains certain behaviour, with the motivation to explore how interaction make technology actionable (Faraj & Azad, 2012; Majchrzak et al., 2013; Norman, 2011). In this study that means that we direct our interest towards how the public’s use of wearable digital technology such as smartphones enable and/or constrain a set of actions for the individual police officers in their work practices while being filmed (Gibson, 1979; Norman, 2011). In this study we are also interested to understand how technological affordance also foster different types of accountability.

**Accountability**

The meaning of accountability may take different shapes depending on the interaction between human actions and the technology, here the cameras. Thus, when police officers are being subject for being filmed by the public, they will organise their actions in relation to a set of other actors and demands on governance and accountability. In the analysis of the type of accountability that is associated with the public’s use of cameras to film police in their work, this study draws on the fact that the police is forced to consider that this is a technology that can be used everywhere and in very different ways (Sørensen, 2010). By analysing different forms of accountability the project draws on an extensive international field of research. It is a field of research providing us with perspectives and ideas about how a variety of demands on accountable actions condition how organisations and practices of work emerge within the public sector (Mulgan, 2000; Millen & Stephens, 2012). Two different types of accountability are of specific interest to our analysis. To begin with we will therefore engage in identifying and scrutinising how police officers adjust themselves to demands on actions that meet certain norms and regulations (laws); i.e. normative accountability. Furthermore, we will bring attention to how to approach demands on accountability justified by goals and references to powerful or efficient applications of the technology; i.e. instrumental accountability (Roberts, 1991). In cases when the police are being watched by the public, they often have to consider how to manage complex combinations of these two different forms of accountability.

**Surveillance**

We are interested in examining how the two forms of accountability described above, i.e. normative and instrumental, emerge as meaningful to police officers that constantly have to approach complex networks of digital relations with different implications for how they should approach public demands on accountable police work. By being an investigation into how digital technology enables different forms of surveillance, embedded and sometimes taken for granted in daily settings (Lyon, 2015), the paper will then also bring attention to what in surveillance literature is referred to as counterveillance and sousveillance. The public’s use of surveillance technology, such as smartphones with built-in cameras, to document police officers in the field, can be understood through the concept of
counterveillance (Monahan, 2006) and sousveillance (Mann et al., 2003; Mann & Ferenbook, 2013). Sousveillance, surveillance of the observer and in the context of policing also sometimes called cop-watching (Schaefer & Steinmetz, 2014) relates partly to the network society and the possibilities to rapidly access many users and partly to the expansion of mobile technology (Mann et al., 2003). Sousveillance is closely connected to the development of wearable technology, and in our study more specifically the convergence between phones and cameras. Research shows that powerful surveillance systems cause active resistance where different strategies and tactics are applied to avoid or disturb the ongoing surveillance (Lyon, 2015; Eneman et al; 2018, Ball 2006).

3. Research Approach

The Swedish Police as a case

In this paper we are interested to investigate: How do police perceive citizens’ use of cameras to document them while conducting work? This paper is part of a larger ongoing study investigating different angles related to the implementation, organisation and use of body-worn cameras within the Swedish Police and the study also addresses how the police perceive and respond to the public’s use of camera to film them while conducting their work. The Swedish police is a public authority with a broad societal mission aimed at reducing crime and increasing security in society through preventive, interventive, and investigative activities (Manning, 2008). This implies that the police constitute a concrete case of government work that must relate to a variety of requirements for a responsible and lawful work. As a case, this provides us with access to a rich material allowing us to examine different aspects, for example technological affordance, accountability and surveillance.

Semi-structured interviews

This study has been designed as a qualitative study where semi-structured interviews have been conducted. So far, we have interviewed 17 police (3 females and 14 males) officers within the Swedish police. The interviews were semi-structured and based on an interview guide designed with a number of broader themes that stimulated the respondent’s for in-depth discussions, allowed follow-up questions and thus also provided for perspectives and ideas that we did not anticipate when we created the guide. All the interviews were conducted at the police officers’ workplace and the interviews lasted between 1-2 hours each. Before each interview, we gave information about the study and asked for permission to record. All the interviews were (sound) recorded after approval. Once the recorded interview material was transcribed by the Transcriptions agency the material was read and re-read and notes were made. In the next stage the material was structured and coded in relation to the research question as an iterative process (Silverman, 2014).

4. Preliminary results

The preliminary result from the interviews with police officers shows at this early stage:

Experience and effects of being filmed by the public

All respondents describe that they have experiences of being filmed by the public when conducting their work. A majority of the respondents express that this is something that occur often and on a regular basis and some even described it as something that occur every day and have become part of their everyday work life.
When discussing whether and how the public’s filming affects the police while conducting work, they express some different perspectives. Some respondents describe that they don’t perceive it as a problem when being filmed from a distance:

Well, I don’t see it as a problem [...] so long that they are not up in the face with the camera [...] however when you talk about sensitive stuff with someone for example when you have seized someone then you don’t want people to be there and film since that could disturb our work (Police 10)

The attitude and experience of being exposed to cameras and being filmed also seem to be viewed as a generation issue:

I don’t think it affects me so much. It is something that has been with me in my whole career as police since I have worked such a short time. So, it feels that it has been there since I started as police. It is a natural element that there almost always is someone using their camera to film, but I know that what we are doing is right and I have nothing to hide so if they want to film, they can do so (Police 9)

Several respondents’ expressed concerns of being filmed and emphasize anxiety over why they are being filmed and how the material later will be used. The concerns also refer to the capital of violence of the criminal persons that may have filmed them and discuss if the filming perhaps was meant to provoke and disturb them while doing their work or perhaps to map out the police officers. Some of the respondents reveal that they are used to veiled threats when working in for example socially vulnerable areas.

I think it can affect very much, both in a good and bad way naturally. I don’t think that anyone is feeling well by getting their work surveilled like that [...] films that I will never see and I don't have a clue how they will use and circulate them. So obviously it is an uncertainty, absolutely, definitely. Another aspect is this with the mapping, you can easily identify that these persons are working in this area and how difficult is it then to find images, you can search for images on Google or Facebook and quite quickly find out who is who. So, it is a serious threat, hands down, and this mapping could be published on any forums. These persons work in this area, these are the police officers, this is how they look and this is how their families look (Police 11)

Reasons for the public to film the police
When discussing why the public starts to film the police while conducting their work the respondent state that they believe there are a number of different agendas for doing so. People are curious and often start to film when the police for example is conducting different interventions to share what is regarded as exiting material via social media to show what the police are doing. They also talked about that the filming can take different form, one form as the mentioned curiosity filming from what they regard as a more acceptable distance and another form that is intrusive and occur when the public is standing close and film with the mobile camera near the police officers’ face:

When you are conducting an intervention and have people around you, then the mobile phones are there quickly, to film. The same thing with commandeering and demonstrations, when it starts to be messy then the cameras are there directly. Sometimes because it is exciting and they want to capture it and sometimes due to questioning what we do and that something is wrong. Sometimes I think it is to provoke, this with pressing the camera up in
our faces with the words ‘I have the right to film you’, that is not unusual [...] I would say that this has escalated lately with social media (Police 2)

The police authority is unique since they as state representatives are entitled to make us of force at work and therefore could be expected to be held accountable for their activities. Some of the respondents described situations when they have been filmed with arguments brought forward from the public about elements of disproportionate use of force. According to several of the respondents the filming could in these cases be understood that the public wants to obtain contrary evidence as a form of an instrument of power to reveal police misconduct:

We had an intervention a while ago when a person thought it has been a situation with police brutality and they started to film to show that it was wrong and that we don’t make correct work decisions and that our interventions are not correct [...] but I would say that we know what we are doing [...] they want to keep track of who is the bad cop, they say so ‘well that is the bad cop or the evil cop or assault or whatever it is (Police 8)

The police’s counter-strategies towards being filmed by the public
As mentioned earlier, the public’s filming of the police can be understood as a form of sousveillance aiming to document and exposure police behaviour and as we know from existing research (Lyon; 2015; Eneman et al, 2018; Eneman; 2009) surveillance do provoke and cause activities where different strategies are developed by individuals to avoid or disturb the ongoing surveillance.

The preliminary result from our study shows that the police officers have used different counter-sousveillance strategies. We build upon Marx (2003) categories - intimidation, legal punishment, confiscation and destruction - in our analysis of the police officers’ counter-strategies. The categories were originally coined by Marx (2003) and has later been used by other researchers to understand strategies in relation to surveillance (e.g. Sandhu, 2016).

The category intimidation refers to when police try to avoid being filmed (subject for sousveillance) by ordering the public to stop using the cameras to film by using arguments that the filming disturb their work. Our material shows elements of intimidation when for example the respondents describe different situations where they have ‘pushed away’ persons that filmed them and told them to move and go away since they were ‘disturbing the police work’. In some cases, they have also used arguments that the filming could be seen as illegal since it obstructs their police work and that touches upon the category legal punishment, which refers to when police try to invalidate when the public film by claiming that it is illegal. Next category confiscation refers to the activity when the police confiscate the cameras used by the public. Several of the respondents express that they have experience of confiscating mobile phones directly when something has happened and when citizens has filmed with their mobile phones or cameras. The principles of legality in relation to this type of confiscation could however be questionable even in those cases where the police claim that they are allowed to do so if they think that the camera may contain material that could be of vital evidence for their work (Sandhu, 2016). The respondents describe that citizens often are willing to give and share the film material with them, but if they don’t do that willingly we (as the police) can confiscate their phone anyway. A possible activity related to confiscation is the next category called destruction, which refers to when cameras or phones have been confiscated and then the police delete material that has been recorded and/or even destroy the camera or phone. One respondent described a situation that contains elements of both confiscation and destruction (deleting of material) like this:
Then it has also happened that you have confiscated phones on the spot ‘you have filmed, I need the film’. Sometimes it could be solved directly if it’s a single image that could be sent to us, then you don’t have to confiscate the whole phone. Otherwise if it’s film material on a phone that we need, then it’s gone. Then we will take it with us to the station and empty it. (Police 11)

*Other reflections of being filmed*

Other aspects related to citizens’ filming of police when working that was mentioned during the interviews are:

Several of the respondents expressed concern regarding that the public relatively often use their mobile phone to film when traffic or other crisis incidents occur in society, they are also concerned that citizens often tend to film more sensitive situations when for example people with mental health problem are involved or victims or underaged persons.

Social media was discussed by many of the respondents and is considered to have vital effects for the interest of filming the police while conducting work, which could be understood through the concept of technological affordance to further analyse what behaviour the involved technology enable. The respondents described and reflected upon both advantages and disadvantages with social media in relation to being filmed.

On the one hand, several of the respondents mentioned advantages related to that evidence could be obtained and secured that could be useful for police investigations. Some respondents described that they have searched for film material that the public has created and made available on social media (for example YouTube) and that the material later has been used as crucial part of investigation work.

On the other hand, several of the respondents described aspects of insecurity and vulnerability in relation to being filmed and when the material is published and circulated on social media. One respondent expressed the feeling of exposure like this:

*It is probably that feeling that you could be exposed as police, that I’m a police and has chosen this work but I may not have chosen to become a clip on YouTube that people are sitting and laughing at. I think many police officers can feel like that, it doesn’t have to be that you have something to hide. Maybe you feel that you have done the right thing, but still you may not want to be that famous face that gets a lot of clips on YouTube with people laughing at you. If you have ended up in a disadvantaged situation or whatever it could be, I imagine that could be very insulting.* (Police 10)

**5. Conclusion**

The aim of this research in progress paper was to address the question - how do police perceive citizens’ use of cameras to document them while conducting work? The result shows that the police officers consider citizens’ use of camera to film them while conducting work to contain both positive and negative elements. In addition, the result also shows that the police have used different strategies in form of counter-sousveillance to avoid and/or disturb being subject for citizens filming i.e. sousveillance. Finally, we believe that our preliminary results will contribute to the existing literature with empirical insights based upon interviews with individual police officers to obtain their stories about how they relate, understand and respond to wearable cameras as a form of powerful surveillance technology.
Acknowledgement
We would like to thank all the respondents for generously sharing their expertise and perspectives with us. This research is funded by Swedish Research Council for Health, Working Life and Welfare.

References
Foucault, M (2003) Övervakning och straff, Arkiv förlag
Roberts, J (1991) The possibilities of accountability, Accounting, Organisations and Society, 16(4)
Silverman, D (2014) Doing Qualitative Research, SAGE Publications
Treem & Leonardi, 2012
Augmented education within a physical space

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Abstract
This research aims to explore how to enhance student engagement in higher education institutions (HEIs) using a novel conversational system (chatbots). The study applies a design science research (DSR) methodology and is executed in three iterations: persona elicitation, survey and student engagement factor models (SEFM), and chatbots interactions analysis. In the first iteration, two k-means clustering analyses are applied to student data, including engagement on campus and student interaction with a virtual learning environment (VLE). The first analysis produces four different types of students based on their engagement and performance data, while the second analysis produces two clusters based on the students’ interactions with a VLE (in this case, Blackboard). The second iteration will produce SEFMs, which will include the factors that affect student engagement, confirmed using structural equation modelling (SEM). Finally, the third iteration will produce effective and usable chatbots that enhance student engagement. The pragmatic findings from this study will make three contributions to the current literature. Firstly, machine learning is used to build data-driven personas using k-means clustering. Secondly, a persona template is designed for university students, which supports the construction of data-driven personas. Thirdly, SEFMs will be built. Future iterations will build tailored interaction models for these personas and evaluate them using chatbots technology.

Keywords: chatbots, conversational system, design science research, persona, persona template, student engagement

1. Introduction
Student engagement refers to the extent to which students are interested or involved in their learning and how are they linked to other students, their classes and their institutions (Axelson and Flick 2010). Three dimensions of student engagement have been proposed: 1) behavioural engagement, represented by behavioural norms such as attendance and involvement; 2) emotional engagement, represented by emotions such as enjoyment, interest and a sense of belonging; and 3) cognitive engagement, represented by investing more time in learning beyond that required (Bloom 1965). This study focuses on behavioural and cognitive engagement.

Student engagement has received significant attention in the literature since the 1990s (Trowler 2010), particularly in terms of its value for learning and achievement.
(Newmann 1992). Trowler and Trowler (2010, p.4) believe that “the value of engagement is no longer questioned”. Student engagement is considered a predictor of student performance (Martin and Torres, 2000; Astin, 1984) and one of the main factors behind students’ boredom, alienation, low performance and high dropout rates (Martin and Torres 2000). The literature shows that HEIs are facing a critical problem with low-level student engagement. Several teaching methods, tools and strategies have been developed to solve this problem. For example, with the significant increase in the number of internet users and mobile phone owners, there has been great interest in employing these devices in class and outside of class to improve student participation (Taylor and Parsons 2011; Lim 2017).

Furthermore, the literature shows that there are many benefits of using chatbots in education: chatbots are enjoyable, support continuous learning, enhance student motivation, enhance students’ skills, offer an interesting form of encouragement (Shawar and Atwell 2007) and assist teachers in their jobs (Knill et al., 2004; Shawar and Atwell, 2007). After analysing the literature, a literature gap has been identified: no previous study has investigated the use of novel conversational systems in HEIs to enhance student engagement.

2. Research Methodology

The DSR methodology is the principal research methodology for this study, adapted from Vaishnavi and Kuechler (2004) to meet the research aim. A valid information system (IS) research process is conducted through the building and evaluation of designed artefacts (Hevner et al. 2004). This research is conducted using incremental iterations, with each iteration utilised to expand on and refine the research problem. To achieve the study’s aim and objectives, the study is conducted in three iterations: persona elicitation, survey and SEFMs, and chatbots interactions analysis, as shown in Figure 1. Each iteration is performed in four phases: 1) problem awareness, 2) suggestions, 3) development and 4) evaluation (Vaishnavi and Kuechler 2004). The iterations are described in the following sections.
2.1 Persona Elicitation

The objective of the first iteration, persona elicitation, is to identify different types of university students by building data-driven personas. The problem awareness phase includes conducting a literature review on student engagement and the state of the art of mobile educational technologies (e.g., chatbots). In the suggestions phase, a proposed persona template for university students is developed. Further suggestions are to identify different groups of students in the Computer Science Department at Brunel University London by utilising a machine learning framework, applying k-means clustering analysis and building student personas. The sample included second-year Computer Science students at Brunel University London in 2014 and 2016. The two sets of student data are 1) engagement on campus data, containing students’ engagement and performance data, and 2) VLE data, including active participation and interaction with materials on Blackboard. The development phase includes building a university student template based on the literature review and an understanding of the users’ backgrounds and skills.

The literature shows that persona templates have been covered in many studies (Roussou et al. 2013). Their elements differ based on their reasons for creation. A persona template usually includes demographic data (Roussou et al. 2013) such as name (Hill et al. 2017), age (Nieters, Ivaturi, and Ahmed 2007; Roussou et al. 2013; Hill et al. 2017), gender (Nieters, Ivaturi, and Ahmed 2007), job (Hill et al. 2017), language (Roussou et al. 2013), place of residence (Hill et al. 2017) and picture
(Nieters, Ivaturi and Ahmed, 2007; Roussou et al., 2013; Hill et al., 2017; Guo and Razikin, 2015). Furthermore, it can include users’ interests (Roussou et al., 2013; Hill et al., 2017), activities (Guo and Razikin 2015), preferences (Hill et al. 2017) and attitudes in daily life (Guo and Razikin 2015). Moreover, it can cover skills and experience, such as educational level (Roussou et al. 2013) and IT certification. The initial student persona template proposed in this study consists of the following categories: demographic data (Nieters, Ivaturi and Ahmed, 2007; Roussou et al., 2013; Hill et al., 2017), motivations and interests (Roussou et al. 2013; Hill et al. 2017), and skills and experience (Roussou et al. 2013). A further template will be added after the data analysis.

A k-means clustering method is implemented in R programming language. The k-values are identified using well-known methods: elbow, silhouette and gap statistic methods (Kodinariya and Makwana 2013; Tibshirani, Walther, and Hastie 2001). Descriptions of the main attributes of the first dataset, engagement on campus data, are shown in Table 1. The first data analysis resulted in four student clusters. Figure 2 presents the distribution of the student data in each cluster. Statistical summaries of the first phase of data analysis are shown in Tables 2a, 2b, 2c and 2d.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance</td>
<td>Represents the total lab attendance by each student out of 12 labs</td>
</tr>
<tr>
<td>Grade</td>
<td>Represents the final grade in that module, ranging from 1 to 17, where 1 represents F and 17 represents A*</td>
</tr>
</tbody>
</table>

Table 1. Engagement on campus data

![Figure 2. The four clusters from the first phase of data analysis](image)
Cluster 1 includes students with low grades and low attendance rates. Table 2a shows that the median of student attendance was 4 out of 12 labs (30%); the median of the grade attained was 3 out of 17 (17%). The attendance of students in Cluster 1 ranged between 0% and 66%. Similarly, their grades were all less than 50% (F to D). Cluster 1 is referred to as “very low engagement and very low performance” (Table 2a).

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Median</th>
<th>Trimmed</th>
<th>Mad</th>
<th>Min</th>
<th>Max</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance</td>
<td>4.00</td>
<td>2.11</td>
<td>4</td>
<td>4.04</td>
<td>2.97</td>
<td>0</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Grade</td>
<td>3.36</td>
<td>1.71</td>
<td>3</td>
<td>3.26</td>
<td>1.48</td>
<td>1</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 2a. Statistical summary from the first phase of data analysis: Cluster 1

Cluster 2 includes students with high attendance rates and high grades. Table 2b shows that the median of student attendance was 10 out of 12 labs (83%); the median of the grade attained was also high at 15 out of 17 (88%). Their attendance rates ranged between 56% and 100%, and their grades ranged from 12 to 16 (B to A+). Cluster 2 is referred to as “high engagement and high performance” (Table 2b).

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Median</th>
<th>Trimmed</th>
<th>Mad</th>
<th>Min</th>
<th>Max</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance</td>
<td>9.97</td>
<td>1.62</td>
<td>10</td>
<td>10.09</td>
<td>1.48</td>
<td>7</td>
<td>12</td>
<td>5</td>
</tr>
<tr>
<td>Grade</td>
<td>14.80</td>
<td>1.21</td>
<td>15</td>
<td>15.00</td>
<td>0.00</td>
<td>12</td>
<td>16</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 2b. Statistical summary of the first phase of data analysis: Cluster 2

Cluster 3 includes students with low attendance rates and very good grades. Table 2c shows that the median of student attendance was only 4 out of 12 labs (30%), and the median of the grade attained was 12 out of 17 (70%). The rates of attendance were all less than 50%, while the grades ranged between 52% and 88% (C to A). Cluster 3 is referred to as “low engagement and high performance” (Table 2c).

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Median</th>
<th>Trimmed</th>
<th>Mad</th>
<th>Min</th>
<th>Max</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance</td>
<td>3.92</td>
<td>1.43</td>
<td>4</td>
<td>3.95</td>
<td>1.48</td>
<td>1</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Grade</td>
<td>12.48</td>
<td>2.13</td>
<td>12</td>
<td>12.60</td>
<td>4.45</td>
<td>9</td>
<td>15</td>
<td>6</td>
</tr>
</tbody>
</table>

Table 2c. Statistical summary of the first phase of data analysis: Cluster 3
Finally, Cluster 4 includes students with good attendance rates and low grades. Table 2d shows that the median of student attendance was 7 out of 12 labs (58%), and the median grade of the grade was 9 out of 17 (52%). The attendance ranged between 5 and 12 (40% to 100%), while the grades ranged between 35% and 70%. Cluster 4 is referred to as “better engagement and low performance” (Table 2d). Descriptions of the four clusters that resulted from the analysis of the first dataset, along with their rules, are provided in Table 3.

<table>
<thead>
<tr>
<th>Cluster Number</th>
<th>Cluster Title</th>
<th>Description</th>
<th>Rule</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Very low engagement and very low performance</td>
<td>Positive correlation between student engagement and performance</td>
<td>Attendance around 30%; grade around 17%</td>
</tr>
<tr>
<td>2</td>
<td>High engagement and high performance</td>
<td></td>
<td>Attendance around 83%; grade around 88%</td>
</tr>
<tr>
<td>3</td>
<td>Low engagement and high performance</td>
<td>Negative correlation between student engagement and performance</td>
<td>Attendance around 30%; grade around 70%</td>
</tr>
<tr>
<td>4</td>
<td>Better engagement and low performance</td>
<td></td>
<td>Attendance around 58%; grade around 52%</td>
</tr>
</tbody>
</table>

Table 2d. Statistical summary of the first phase of data analysis: Cluster 4

<table>
<thead>
<tr>
<th>Attendance</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>7.56</td>
</tr>
<tr>
<td>SD</td>
<td>1.51</td>
</tr>
<tr>
<td>Median</td>
<td>7</td>
</tr>
<tr>
<td>Trimmed</td>
<td>7.52</td>
</tr>
<tr>
<td>Mad</td>
<td>1.48</td>
</tr>
<tr>
<td>Min</td>
<td>5</td>
</tr>
<tr>
<td>Max</td>
<td>12</td>
</tr>
<tr>
<td>Range</td>
<td>7</td>
</tr>
<tr>
<td>Mean</td>
<td>10.19</td>
</tr>
<tr>
<td>SD</td>
<td>1.57</td>
</tr>
<tr>
<td>Median</td>
<td>9</td>
</tr>
<tr>
<td>Trimmed</td>
<td>10.18</td>
</tr>
<tr>
<td>Mad</td>
<td>0.00</td>
</tr>
<tr>
<td>Min</td>
<td>6</td>
</tr>
<tr>
<td>Max</td>
<td>12</td>
</tr>
<tr>
<td>Range</td>
<td>6</td>
</tr>
</tbody>
</table>

Table 3. The four clusters’ descriptions and rules

The clustering analysis for the second dataset, the VLE dataset, which is described in Table 4, produced two clusters. Most students were in Cluster 1 (87%), and a minority were in Cluster 2 (13%) (Figure 3). Cluster 1 is referred to as “less active” students, and Cluster 2 is referred to as “more active” students. Interestingly, most students were less active – they did not spend a lot of time interacting with materials in the VLE. All variables in Cluster 1 had mean values less than Cluster 2, except for grade. Students in Cluster 2 spends more hours on course activity (course access), content (content access), collaboration (course user participation) and communication (user form participation), but they had the same median value as students in Cluster 1.
However, the mean grade values for Cluster 1 and Cluster 2 were the same. An interesting finding is that active participation in the VLE, which was found to be an indicator of student engagement (Dale and Lane 2007), did not influence student performance. The two clusters had the same grade results, as represented by the median grade in Table 5. Descriptions of the two clusters that resulted from the second analysis, along with their rules, are shown in Table 6.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course activity</td>
<td>The total amount of course activity in hours the user completed</td>
</tr>
<tr>
<td>Content</td>
<td>The total amount of time in hours that the user spent accessing content for the course (files, links and videos)</td>
</tr>
<tr>
<td>Collaboration</td>
<td>The total amount of time in hours that the user spent on collaborative activities</td>
</tr>
<tr>
<td>Communication</td>
<td>The total amount of time in hours that the user spent engaging in discussion boards/forums</td>
</tr>
<tr>
<td>Grade</td>
<td>The final student grade in the specific module</td>
</tr>
</tbody>
</table>

Table 4. Attribute descriptions for the VLE data

![Figure 3. The two clusters from the second phase of data analysis](image-url)
### Table 5. Statistical summary of the second phase of data analysis

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster 1</td>
<td>4.96</td>
<td>0.39</td>
<td>25.62</td>
<td>6.11</td>
</tr>
<tr>
<td></td>
<td>10.00</td>
<td>1.00</td>
<td>31.00</td>
<td>10.88</td>
</tr>
<tr>
<td></td>
<td>13.00</td>
<td>1.00</td>
<td>55.00</td>
<td>16.04</td>
</tr>
<tr>
<td></td>
<td>1.00</td>
<td>0.00</td>
<td>9.00</td>
<td>1.43</td>
</tr>
<tr>
<td></td>
<td>12.00</td>
<td>1.00</td>
<td>16.00</td>
<td>10.97</td>
</tr>
<tr>
<td>Cluster 2</td>
<td>13.32</td>
<td>6.25</td>
<td>34.55</td>
<td>17.05</td>
</tr>
<tr>
<td></td>
<td>32.00</td>
<td>8.00</td>
<td>53.00</td>
<td>31.27</td>
</tr>
<tr>
<td></td>
<td>42.50</td>
<td>13.00</td>
<td>682.00</td>
<td>71.73</td>
</tr>
<tr>
<td></td>
<td>6.00</td>
<td>0.00</td>
<td>24.00</td>
<td>6.69</td>
</tr>
<tr>
<td></td>
<td>11.50</td>
<td>3.00</td>
<td>16.00</td>
<td>10.96</td>
</tr>
</tbody>
</table>

### Table 6. The two clusters’ descriptions and rules

<table>
<thead>
<tr>
<th>Cluster Number</th>
<th>Cluster Title</th>
<th>Description</th>
<th>Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Less active or less engaged</td>
<td>The means of all the variables were two or three times lower than those for Cluster 2, except the grade variable.</td>
<td>The means were 6.11, 10.88, 16.04, 1.43 and 10.97 for course activity, content, collaboration, communication and grade, respectively.</td>
</tr>
<tr>
<td>2</td>
<td>More active or more engaged</td>
<td>The means of all the variables were two or three times higher than those for Cluster 1, except the grade variable.</td>
<td>The means were 17.05, 31.27, 71.73, 6.69 and 10.96 for course activity, content, communication and grade, respectively.</td>
</tr>
</tbody>
</table>

Based on the literature review discussed previously, the proposed university student persona consists of demographic data, educational data, motivations and interests, and skills and experience. However, there are also other essential elements that should be included in the persona template for university students: educational data, interaction with the VLE, engagement and performance data, as shown in Table 7. These were extracted from the two data analyses explained above. The proposed persona template for university students is shown in Figure 4.

### Table 7. Components of the student persona template

<table>
<thead>
<tr>
<th>Components of the Student Persona Template</th>
<th>Demographic Data</th>
<th>Educational Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interaction with the VLE</td>
<td>Engagement and performance</td>
<td></td>
</tr>
<tr>
<td>Motivations and interests</td>
<td>Skills and experience</td>
<td></td>
</tr>
</tbody>
</table>
In the evaluation phase, student perspectives will be explored using a survey and chatbots instantiation.

2.2 Survey and SEFM
The objective of the second iteration, a survey and SEFM, will be to build SEFMs. The problem awareness step will draw on the results of the first iteration. In the suggestions phase, a literature review will be conducted to identify the factors that affect student engagement. In the development phase, an SEFM will be created and will only include factors that can be tested using chatbots. The evaluation phase will consist of the validation of the SEFM using a semi-structured survey sent via email to all Computer Science students at Brunel University London. The data will be analysed using SEM statistical techniques to produce the final version of the SEFM, which will be fed into the next iteration.

2.3 Chatbots Interactions Analysis
The objective of the third iteration, chatbots interactions analysis, will be to evaluate the effectiveness of using chatbots to enhance student engagement. The problem awareness phase will draw from the results of the SEFM. In the suggestions phase, chatbots will be designed and developed, based on the student persona, survey and SEFM results (the first and second iterations). In the development phase, chatbots will be designed and developed to match the requirements proposed in the suggestions phase; the code will be written in JavaScript and will run on Amazon Echo devices (Alexa) and mobile devices. In the evaluation phase, the chatbots will be evaluated in terms of usability and effectiveness in enhancing student engagement using the System Usability Scale (SUS), and evaluated pre-test and post-test.
3. Expected Contributions

The contributions of this study will stem from the three iterations. The data analysis of the first iteration produced a university student template and four distinct university student personas using k-means clustering analysis, which is applicable, cheap and straightforward compared to the other methods used by Cisco and Microsoft (Nieters, Ivaturi and Ahmed, 2007; McGinn and Kotamraju, 2008). Interestingly, the results of the data analysis show that engagement does not always affect student performance. In addition, active participation does not influence student engagement. There might be other factors that affect student engagement. The data analysis of the semi-structured survey will be used to produce an SEFM, which will be tested by the chatbots. Finally, the chatbots interactions analysis iteration will be the main contribution of this study; developing effective and usable chatbots that will enhance student engagement.

4. Conclusion

In conclusion, the purpose of this study is to address the problem of low-level student engagement in HEIs in a creative way using DSR methods, performed in three iterations. The persona elicitation (first iteration) has been done, producing robust results, and two more iterations will be performed in the next nine months: 1) a survey and SEFM and 2) chatbots interactions analysis.

References


Roussou, Maria, Maria Vayanou, Akrivi Katifori, Stefan Rennick-Egglestone, and Laia Pujol. 2013. “A Life of Their Own: Museum Visitor Personas Penetrating
the Design Lifecycle of a Mobile Experience,” 547–52.
The impact of social media on social entrepreneurship in a developing country

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University of the West of Scotland

Wilson Ozuem
University of Cambria

Abstract

The aim of this paper is to explore critical issues that influence Bangladeshi social enterprises to embrace social media as a business tactic. The outcomes attained of this research are contrasted with issues that have impacted on IT implementation according to the literature. In addition, the paper investigates how social media implementation affects patterns of business and identifies some difficulties and challenges that social enterprises face in terms of application. The research gap of this study is addressed in the setting of the developing world. The paper also explores the benefits of harnessing social media.
Introduction

Social media platforms (for example, Facebook, Snapchat and Instagram) are increasingly accepted as vital to the day-to-day lives of millions of users who interact in virtual environments. This new way of communication continues to dominate the cultural landscape and impacts on how users do business (Alalwan, Rana, Dwivedi, & Algharabat, 2017; Rathore et al., 2016). Thus, social media is regarded as one of the most effective and persuasive interactional environments in modern life (Garcia-Morales, Martín-Rojas, & Lardón-López, 2018). On the other hand, the rapid development of technology and intense rivalry between businesses has meant that the business community is continuously searching for new ways to distinguish themselves and provide value to clients. Social media is a phenomenon that has been facilitated by the age of the Internet and a rise in the general usage of digital media. It has motivated businesses to engage with different corporate segments and has driven many towards the adoption of innovative modes of interaction.

The intensification of social media has changed the way interactions take place with customers (Garcia-Morales et al., 2018; Islam and Chitran, 2019). Blogs, social networking sites, content communities, virtual worlds or collaborative projects collectively represent groups of individuals that generate and distribute content internally and outside of specialised practices. Businesses are starting to adopt social mechanisms to connect with their clients. This new description of customer engagement has meant that firms have begun to establish reliable relationships with their customers that are durable and popular (Ozuem, Almeida, Pinho, & Azemi, 2016).

An increasing amount of research has revealed numerous motives for the uptake of social media usage amongst companies (Scott & Orlikowski, 2014; Uyar & Boyar, 2015; Leonardi, 2014). In several cases, researchers have focused on the practice of internal social media stands (Scott & Orlikowski, 2014; Lee, 2017; Huang, Baptista, & Galliers, 2013; Ayvaz, Gürsun and Özlale, 2018) by prominent companies communicating with international networks (Leonardi et al., 2013; Jagongo & Kinyua, 2013). In this sense, social media offers many interactional benefits and outcomes that were previously difficult and often impossible to attain (Leonardi, 2014; Cheng & Shiu, 2018). Social media facilitates an innovative way to share knowledge (Koch, Leidner, & Gonzalez, 2013; Pulido et al., 2018) and a new means to reach geographically isolated users (Huang, Baptista, & Galliers, 2013; Scott & Orlikowski, 2014). Kaplan and Haenlin (2010) have underscored the significance of social media
platforms and proposed some approaches to adopting social media in business. There is scope to explore social media more strictly in terms of its uses in social enterprise. Indeed, most academic literature examines commercial enterprises rather than social enterprises when it comes to social media. A consequence of this is that researchers have perhaps overlooked an essential context (Koch, Gonzalez, & Leidner, 2012; Vandenbosch & Eggermont, 2016; Kaplan & Haenlein, 2010) and have tended to depend on the inaccurate hypothesis that social entrepreneurs do not understand and are thus unable to take full advantage from social media (Ho, 2016). Besides, such assumptions do overlook the fast-paced nature of technology and variation in the types of users and business settings that are implicated.

**Contextualisation: social media**

Social media is a relatively recent spectacle that has altered how businesses function (Garcia-Morales et al., 2018; Scott & Orlikowski, 2014). Indeed, enterprises are increasingly capable of obtaining core resources which have previously been inaccessible to them (Aral, Dellarocas, & Godes, 2013; Treem & Leonardi, 2012). Social media has also supported commerce by increasing the value of businesses and by allowing organisations to foster tactical partnerships (Treem & Leonardi, 2012; Kane et al., 2014; Helal & Ozuem, 2017). Social media helps businesses to establish new interactions and relationships with clients and traders. The practice of social media in management settings is comparatively new (Wamba & Carter, 2014; Huang, Roberts, & Tan, 2017; Azemi & Ozuem, 2016) although universal acceptance of social media is increasingly observed in organisational surroundings. Currently, these platforms have been harnessed to fulfil vital roles for businesses as they permit traders to have an existence in online ‘spaces’ that their clients and other stakeholders occupy (Culnan, McHugh, & Zubillaga, 2010; Aral, Dellarocas, & Godes, 2013; Kane et al., 2014; Azemi & Ozuem, 2017).

Spending on social media tools (social networking sites, content communities and collaborative projects) is intensifying in the business world (Islam and Chitran, 2019) and the rising number of stakeholders that turn to social media platforms is not surprising in an organisational context. Miglani (2014) suggested in his research that social media outlays in the US will rise from around $8.2 billion in 2014 to $18.7 billion by 2019. This predicted upsurge underscores a radical change in the direction of social media usage in trade, signifying that acceptance of these technologies is similar to and to some extent more remarkable than acceptance of other IT (Huang, Roberts, & Tan, 2017; Culnan, McHugh, & Zubillaga, 2010). At present, most shared social media promotion practices among businesses
include forming and maintaining an online presence of a ‘page’ to attract followers. Social media then becomes useful for sustaining community relations and leading market investigations. Social media sites are also useful for providing buyer support and hosting customer reviews and feedback (Cheng & Shiu, 2018; Pulido et al., 2018).

It has been seen that studies related to social media are limited to developed countries (Durkin, McGowan, & McKeown, 2013; Kim, Lee, & Lee, 2013) compared to developing countries. Thus, there has been less focus placed by the researcher on social media as a marketing tool in developing nations. There are only a few pieces of evidence that can be found, such as Malaysia, on the perspective of implementing new technologies in some Asian countries.

**Social entrepreneurship**

Awareness of social entrepreneurship within the academic world and amongst government only developed in the 1990s. This took place alongside the evolution of new media in the 2000s. In 2004, social cooperatives were launched in the UK to help social businesses to harness their returns and resources for social purposes (Defourny & Nyssens, 2013). As the borders between government, not-for-profit and commercial sectors have become increasingly blurred (Jayakar Pai and More, 2018; Dunkwu et al., 2016) and as further ground-breaking and profitable ways of addressing social problems have emerged, there has been a greater focus on how ideas like social entrepreneurship can address critical social problems (Dees & Anderson, 2003).

Even though the focus on social-oriented business has increased over the years (Caringal-Go and Hechanova, 2018; Dacin et al., 2011; Thompson et al., 2000), the concept of social entrepreneurship still remains unclear (Jayakar Pai and More, 2018; Certo & Miller, 2008; Dacin et al., 2011; Islam and Chitran, 2019). Scholars such as Smith, Bell, and Watts (2014) have suggested that more comprehensive research to look at how advanced social projects are determined is essential in order to comprehend the phenomena more clearly. In addition, since much research has emphasised the charitable nature of social enterprises, their commercial role has never fully come into focus (Caringal-Go and Hechanova, 2018; Dees, 1998).
Positioning social media within social enterprises

In this study the process of resource mobilisation in terms of developing market strategy is considered to be a prominent research gap. During the growth phase, every organisation needs to do its marketing broadly (Helal, Ozuem and Lancaster, 2018), which involves extensive resource acquisition. The selection of this gap was determined by many aspects. Regardless of the dominant theoretical evidence on the role of marketing in the development of commercial businesses, it is a surprising fact that there is a lack of academic research on marketing in the context of social enterprise (Dunkwu et al., 2016; Islam and Chitran, 2019). On the other hand, to obtain required funding, influence customers’ perception, spread business activity and distinguishable business models, social enterprises need to promote themselves (Dunkwu et al., 2016).

Compared to developed countries, in developing countries like Bangladesh, social enterprises operate in a condition of constrained resources (Islam and Chitran, 2019). They regularly compete with several other organisations for resources together with the shortage of capital and lack of expert employees. Inadequate funding is considered a primary obstacle for the growth of social enterprises in developing countries, especially in the Asian region (Kim & Lim, 2017).

Social media can deliver an excellent return for entrepreneurs and can help them to capitalise on social investments (Helal et al., 2018). Currently, almost all types of businesses are engaging in social networking communications (Cheng & Shiu, 2018). The cooperative actions of entrepreneurial organisations and their partners through two-way communication on social media platforms has proven productive (Gavurova et al., 2018; Lacka & Chong, 2016; Singaraju et al., 2016). The co-creation of new products, facilities, concepts and systems has been accelerated with the evolution of social media (Drummond et al., 2017).

As a consequence of rapid increases in the number of social media formats, many corporations including governmental organisations continue to adopt social media platforms as an essential communications tool to interact and collaborate with others to share content (Kim & Ko, 2012). At the same time, integrated marketing activities are becoming cost-effective when social media marketing is adopted (Kim & Ko, 2012). The returns on social media publicising include high exposure, increased sales, the ability to attract influential followers and the growth of trade. Companies that eschew online advertising through social media risk missing out on new ways to connect with consumers.
Although much discussion has taken place regarding the benefits of social media for business progression, the reliability of such modes of communication has not yet been proven (Maree, 2017). In this sense, social media can produce positive impacts but is also subject to a number of limitations in a business context (Islam and Chitran, 2019). In addition, many social entrepreneurs are not sufficiently technologically skilled, and there is a scarcity of time and information available to them to learn new skills. Consequently, the full potential of social media is unrealised by many (Jones, Borgman, and Ulusoy, 2015; Gavurova et al., 2018). Entrepreneurs typically find it hard to choose appropriate types of social media from several options, and the choice and range of available strategies can often be overwhelming (Jones et al., 2015). Even when an appropriate platform has been identified, social media use can still be a negative experience for many as they are free to access and open to all users, and anyone can be openly critical without requiring any authorisation or validity.

**Managerial implications**

This research adds to current literature in IS innovation adoption in the organisational field. It has reasoned that the acceptance of new technologies is influenced by many aspects. Specifically, the research is formed on the technology-organisation-environment (TOE) framework to investigate issues addressing social media acceptance in the organisational context of social enterprises. The key usages and barriers to adopting social media among social enterprises in Bangladesh have been examined. A list of benefits and barriers was acknowledged through this qualitative study.

Among the identified barriers, lack of resources has been found amongst almost all of the non-adopters. A lack of IT skills and the awareness that the business can perform well without having social media options has also been found as a barrier for social enterprises that have not yet adopted social media. Fear of getting an adverse response was also recognised as a barrier to social enterprises accepting social media.

This investigation identified new critical factors that influence the adoption of social media in a social enterprise context. This study also offers insights in the TOE framework by evaluating the significance of the three TOE framework elements in the implementation of an explicit technology like social media.

Many social entrepreneurs are still not technologically skilled and lack the time and knowledge to develop new skills in social media (Islam and Chitran, 2019; Venkatraman &
Fahd, 2016; Ozuem, Patel, Howell, & Lancaster, 2016). Consequently, social media remains an enigmatic prospect for many (Jones et al., 2015). Entrepreneurs find it hard to choose appropriate types of social media from several options that are creating fragmented media choice for business utilisation (Jones et al., 2015). Even when an appropriate platform is identified, negative experiences are common as social media sites are free for all users to access, and anyone can be openly critical without requiring any authorisation and validity.

Many theoretical explanations have contributed to the development of social entrepreneurship (Islam and Chitran, 2019). It can be approached in terms of its economics, its politics and its psychological implications. However, this research has focused on social entrepreneurs and marketing approaches. It is likely that this work will add to the literature on social media usage in social enterprises and it will help others to better understand social media in the context of developing countries.

The key input of this research is evolving a TOE framework for social enterprises in Bangladesh to adopt social media as a marketing and communication tool. It has found that the key TOE elements drive a social enterprise to adopt social media. Social enterprise initiators will be able to use the TOE framework suggested in this study to evaluate the circumstances under which social media may be implemented. This study will also help to increase cognizance of the diverse issues manipulating decisions as to whether or not to accept these technologies. The results obtained from this investigation might benefit not only social enterprises but also other enterprises including large organisations which are struggling with the same problems and intend to adopt social media. It might help them to overcome the complications that most businesses face when approaching social media as a type of marketing or communications strategy. At the same time, it might inform other companies that have not yet committed to social media, and it might encourage others to reassess their application. Consideration of the complications that social enterprises face when employing social media tactics might aid government associations in projecting essential guidelines so that social business operations can progress and, consequently, the economies of developing countries can grow.
References


Technological Effects on Victim Identification in Police Investigations of Child Abuse Material

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Abstract
The development and use of digital technologies have profound effects in society. One the one hand, the technologies can be used for illegal activities such as the production, distribution and possession of child abuse material. On the other hand, the technologies can be used as powerful and effective tools to combat and investigate these crimes. Child abuse material constitutes crime evidence portraying serious and harmful crimes against children. Law enforcement should therefore focus their efforts on identifying both the offender and the victim involved in the creation of the material. Traditionally law enforcement agencies have focused their efforts on the offenders that have been in focus for identification, prosecution and often also for rehabilitation. Thus, law enforcement has devoted resources towards convictions for the distribution and possession of child abuse material rather than attempting to identify and protect the children in the material. This research in progress paper will therefore explore how digital technologies affect victim identification in police investigations of child abuse material. To explore this area, a qualitative study has been applied with semi-structured interviews with individual police officers at the Swedish Police.

Keywords: digital technologies, technological affordance, child abuse material, police investigations, victim identification
1. Introduction

The development and use of digital technologies have profound effects in society at large and for organizations (Cascio & Montealegre, 2016). On the one hand, the technologies can be used for illegal activities such as the production, distribution and possession of child abuse material. On the other hand, the technologies can be used as powerful and effective tools to combat and investigate these crimes (Reed & Murray, 2018). Digital technologies have facilitated the production, distribution and possession of child abuse material (Eneman, Gillespie and Stahl 2010; Eneman, 2017). Child abuse material, previous often referred to as child pornography, refers to documented material depicting the sexual exploitation of children ranging from images of children posing (usually naked) to material portraying physical sexual abuse. Consequently, child abuse material constitutes crime evidence portraying serious and harmful crimes against children. Law enforcement should therefore focus their efforts on identifying both the offender and the victim involved in the creation of the material. Traditionally law enforcement agencies have focused their efforts on the offenders that have been in focus for identification, prosecution and often also for rehabilitation (Walsh et al, 2013). Thus, law enforcement has devoted resources towards convictions for the distribution and possession of child abuse material rather than attempting to identify and protect the children in the material. It has been highlighted that identifications of victims are difficult and that it is much easier for law enforcement to focus on the offenders both in terms of opportunities for detection and in terms of the publicity derived from successful operations (Davidsson and Gottshalk, 2001: Taylor and Qualye, 2003). The focus should however include both the offender and the victim. Victim identification and child protection should permeate the investigation work of child abuse material. We know from research that sexual abuse of children in many cases occur by an offender closely related to the child and that strongly emphasizes the importance of trying to identify the victim to hinder the abuse to continue and ensure the child is provided necessary therapeutic treatment (Sheldon and Howitt, 2007; Gillespie 2015). The need of academic research regarding victim identification of child abuse material has been articulated both on an international level and on a national level here in Sweden. The awareness and consideration of victims have increased and a number of measures have been taken to improve victims’ possibilities for support and protection in our society. This research in progress paper argues however that much remains to be done within the context of child abuse material and calls for urgent attention for a focus upon victims in relation to this context. The children that have been abused and portrayed in these types of material have been exposed for a serious crime and its documentation (the child pornography material) should be subject for victim identification in order to try and identify the children involved (Interpol, 2017). Therefore, the aim of this research in progress paper is to explore how digital technologies affect victim identification in police investigations of child abuse material. To investigate this specific research area, a qualitative study has been applied using the Swedish Police as a case where interviews with 15 individual police officers have been conducted. All the police officers have been involved in investigations of child abuse material.

2. Child Abuse Material and Victim Identification

Child Abuse Material

It should be noted that child abuse material is not a new phenomenon created by modern digital technology. The phenomenon existed long before the increased digitalisation of our society with historical evidence indicating that adults’ sexual interest in children dates back to ancient times (Taylor and Quayle, 2003: Eneman, Gillespie and Stahl, 2009). Modern
technology has however changed the circumstances for individuals with a sexual interest in children to produce, distribute and access child abuse material. In addition, the technology facilitates interaction with other like-minded individuals sharing the sexual interest of children and for adults to seek contact with potential victims to abuse (Eneman, 2010; Davidsson and Gottschalk, 2011).

Accessing child abuse material prior to the widespread use of digital technology during the mid 1990s was more difficult, often involving a personal visit to a specialist shop or contacting a mail-order company (Gillespie, 2008), which involved physical exposure that increased the risk for the individuals that their behavior would be detected. As recognized modern technology has become the primary medium for the distribution of child abuse material. Furthermore, it has also been recognized that child abuse material available in our digital society is increasing and that the average of age of the children being portrayed in the abusive material is decreasing (Taylor and Quayle, 2003; Quayle et al, 2006). A unique and serious consequence with the use of modern technology as a medium is that even in cases where the offender is caught, the victim identified and the criminal case successfully prosecuted, the harm to the child involved continues since the material are circulating and remains accessible.

This paper deliberately uses the term child abuse material and takes a critical statement against the use of 'child pornography'. The term ‘child pornography’ has been, and unfortunately sometimes still is, used to refer to sexually explicit material of children. Gillespie (2008) notes that experts view ‘child pornography’ as ‘an extremely controversial label’, as it reduces the gravity of what the material portrays and invites comparisons with adult pornography. Furthermore, there is no single accepted definition of the term ‘child pornography’, which can be problematic. Interpol defines child pornography thus: ‘Child pornography is created as a consequence of the sexual exploitation or abuse of a child. It can be defined as any means of depicting or promoting the sexual exploitation of a child, including written or audio material, which focuses on the child’s sexual behaviour or genitals’ (Sheldon & Howitt, 2007). This definition is useful since it highlights the fact that the material can exist in different forms: for example, visual, audio and textual depictions (Gillespie, 2008). Quayle et al. (2008) recognize that there has been a significant change in the discourse when referring to sexually explicit material of children. They note that professionals have started to use the terms ‘abusive images’ and ‘abuse material’. As shown above, with Interpol’s definition, not all sexual depictions of children are visual, therefore the latter term ‘child abuse material’ is perhaps more appropriate as it also captures non-visual material such as audio and text (Sheldon & Howitt, 2007). Definitions and discourses of phenomena are social constructions created within a historical, political and social context. The proposed project will, as mentioned above, use the term ‘child abuse material’ since it more appropriately describes the content of the material.

**Victim Identification**

When an individual sexually abuses a child and documents the act of abuse for future sexual gratification or for sharing and trading with others by using digital technologies, what is really being documented is evidence of a serious crime that it is the obligation of the police to investigate. Photographs and films depicting child sexual abuse found on for example the Internet are not merely a cybercrime occurring online, this material is the documentation of real crime involving physical persons. Victim identification is the term used to describe the analysis of child abuse material, i.e. photographs and films portraying sexual abuse and/or exploitation of a child, with the aim of identifying and locating the child and/or offender involved in the material (Davidsson and Gottschalk, 2011). Victim identification could be described as a combination of traditional investigation work and image and film analysis.
Image analysis within this context refers to the examination of the visual and audio content of those photographs and films for identification purposes (Taylor and Quayle, 2003; Walsh et al, 2013).

Effective victim identification strategies developed on international and national levels are required. They must originate and filter down from the highest level to ensure that the response is comprehensive, cohesive and inclusive at both international and national level (Holland, 2005). There appear, however, to be limited national or international policies on the identification of children in child abuse images whereas many countries have laws that respond to the production, distribution and possession of these images (Finkelhor, 2005).

3. Research Design

This research in progress paper has used the Swedish Police as a case to examine relevant work practices in relation to the investigation of child abuse material. The police is a public authority with a broad societal mission aimed at reducing crime and increasing security in society through preventive, interventive, and investigative activities (Manning, 2008). This implies that the police constitute a concrete case of government work that must relate to a variety of requirements for legitimate and lawful work. As a case, this will provide access to a rich material of different aspects related to crime investigation of child abuse material.

The study has until now conducted interviews with 15 police officers involved in the investigation of child abuse material and the ambition is to conduct interviews with a total number of 20 police officers in order to understand how the individual police officers conduct their investigation work. All the respondents have experience from being involved in investigations of child abuse material. The interviews were semi-structured and based on an interview guide designed with a number of broader themes that encouraged the respondent’s for in-depth discussions, follow-up questions and thus also provided for perspectives and ideas that was not foreseen when the guide was designed. A majority (13) of the interviews with the police officers, were conducted at their workplace whereas two interviews took place via Skype. The interviews lasted between 1-2 hours. each. Before each interview, information was given about the study and permission to record was asked. All the interviews were sound recorded after approval. Once the recorded interview material was transcribed by the Transcriptions agency the material was read and re-read and notes were made.

The study follows the ethical rules and guidance for research formulated by the Swedish Research Council. Informed consent and confidentiality have been applied in the study and personal information has been removed to ensure the confidentiality of those involved.

The next step in the continuance of this study is to complement the interviews with further five police officers from other regions in Sweden. After the focus will be on the analysis and develop this research in progress paper to a full research paper with a more detailed result and a thorough discussion section.

4. Concluding remarks

During the work with this research in progress paper a number of initial interviews were conducted with police officers involved in investigation work of child abuse material. The initial results from these interviews shows at this early stage:
The organisational context, where the crime investigation occur, is central for how the work is organised and can be conducted. The time aspect seems to be noticeable from different angles and that needs to be understood in relation to organisational factors such as resources, competence and prioritizations. One respondent described it like this:

*I would say that one of the largest challenges that we have, is that these cases often are lying for quite some time before they reach us or before we have time to start work with them and then you are limited by time when it comes to search, conduct IP-tracking or do the different actions that are need to find the offender and also to identify victim or if it is several victims. Because that is after all what we want to do.* (Police 1)

Police work should be organised in line with legitimacy and rule of law and therefore guidelines and other policy documents are important for the individual police officers. The identification work related to child abuse material is an activity that requires e.g. competence and time to be able to conduct it:

*You need peace and quiet to be able to work with victim identification and this is unfortunately in many cases a neglected work due to other work such as crime investigation of child pornography with the focus on the suspect. The work with victim identification requires a quite a lot of co-ordination to be effective. We need to know what material to work with and how to work with it There have been a lack of national guidelines or any national manual on how to conduct this. So much of the identification work that been practiced in Sweden has been conducted thanks to a couple of things: that certain individuals understand the value of working with victim identification, because if you work with identification than you need to have time and that requires an understanding from the bosses* (Police 15)

For several of the respondents the involved technology constitutes a difficult and complex dimension to the investigation work. This highlights the need and importance of adequate education and training to secure technological competence for the investigators:

*Well, a great deal of the challenges refers to IT, that is a difficult world for us working with child pornography crimes. It is difficult and we would need how many digital forensics as possible. We would need someone to tell us – how to do things, what does this mean and how to proceed – because it is a difficult world. Even if you are decently skilled at IT, you still don’t know how and what to do with certain things.* (Police 4)

One of the characteristics with digital technologies is that it enables for the distribution and downloading of large volume of material. A consequence of this is that cases with possession of child abuse material can consist of huge volume of images and/or films:

*It was a very large possession crime, I think he was convicted for 340 000 images and films.* (Police 12)

The duality of technology in the context of child abuse material means that on the one hand the technology could be used to produce, distribute and download the material and on the other hand it could be used as powerful and effective tool by law enforcement to investigate the crimes:

*When we sort and examine the material, then we use a technological tool and in our database we can see what material that already has been categorized which make our work easier [*]*
when we have identified and find the material that are illegal we always also analyse the traffic to see where the files come from, how has the suspect got hold of them, has he distributed them or made them available for anyone else? So, we look at that with our software (Polis 12)

It is considered important to work through all the material that has been confiscated to search for any own-produced material, because that could mean that a child or children are in danger and risk being exposed to further abuse. In addition, the investigators are also searching through the material to identify what different times of crime classifications that the suspect should be prosecuted for.

The main reason, from our point of view here, is that we need to examine all material since we don’t know if any part of the confiscated material could contain own-produced images [...] and we always examine all the material. (Police 6)

To conduct crime investigations effectively, it is important with both national and international co-operation and ensuring that investigators involved in the work with child abuse material have access to the same technological infrastructure, which once again highlights the importance of the organisational setting:

A concrete suggestion is to give as many investigators as possible access to the international database with identified victims. Because when you as investigator find images or films in a confiscated computer and not immediately can tell if this is the suspect’s children or relatives or other, then you will ask yourself the question - is the child already identified or is it child that is exposed to danger right now? Therefore, it would save a lot of time and questions for those colleagues if they have access to the database and can do a quick search and find out that these images are already identified, so we don’t need to put time and effort on identifying these particular children. (Police 10)

To conclude, the aim of this research in progress paper was to explore how digital technologies affect victim identification in police investigations of child abuse material. The preliminary results show that digital technologies bring both opportunities and challenges for police investigations of child abuse material. On an organisational level there is a clear need of education and training to improve the technological competence in combination with methods and guidelines for investigating child abuse where victim identification always should have a central role.

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References

Cascio, W & Montealegre, R (2016) How technology is changing work and organizations, Organisational Psychology and Organisational Behaviour, (3)349-375


Reed, C & Murray, A. (2018) Rethinking the Jurisprudence of Cyberspace, Edward Elgar Publishing


Sheldon, K and Howitt, D (2007) Sex offenders and the Internet, John Wiley & Sons Ltd.


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