

# **THEORY CHOICE IN CRITICAL REALIST INFORMATION SYSTEMS RESEARCH**

## **Abstract**

*There has recently been calls for Information Systems (IS) researchers to revisit the dominant mode of theorizing in IS research practice, a process often reduced to “shopping” around for an appropriate theory among a diversity of competing theories. To answer this call, this paper examines the process of theory choice from a critical realist perspective, and in so doing develops guidelines for middle-range theorizing in critical realist IS research. Three steps are identified in this process, these being to (1) understand the background theories relevant to the phenomenon under investigation, (2) contrast and combine these background theories, and (3) situatedly integrate the background theories. The process is illustrated by demonstrating its use in a case study of the emergent usage of adaptive IS.*

**Keywords:** Critical realism, Theory choice, Middle-range theorizing, Background theories

## **1.0 Introduction**

Recently concerns have been raised about the practice of theorising in Information Systems (IS) research (Avison and Malaurent 2014; Grover and Lyytinen 2015). Of particular concern is the scripted manner of most IS research whereby researchers identify a problem, “shop around” for a theory, typically from reference disciplines, and then adapt it to the IS context with minor modification and extension before testing it (Grover and Lyytinen 2015). Grover and Lyytinen (2015) classify this script as mid-range theorizing, that produces theories that are lacking in innovation. Suggestions for improvement have included alternatives to the mid-range script, such as data-driven research, blue-ocean theorizing (Grover and Lyytinen 2015) or “theory light” approaches (Avison and Malaurent 2014). Another alternative for yielding improvement is not to abandon the script all together, but to revisit the process by which borrowed theories are chosen. Rather than “shopping” for a theory, theories can be strategically chosen in relation to the empirical situation. The latter approach to theorizing is known as middle-range theorizing (Hassan and Lowry 2015; Merton 1968) and it constitutes the focus of this paper.

Theories are undergirded by implicit or explicit philosophical assumptions (Archer 1995; Byron and Thatcher 2016). For example, Lee, Briggs and Dennis (2014) proffer requirements that ought to be satisfied when developing a theory of explanation in positivist research. Similarly, Lee and

Hovorka (2015) identify requirements for interpretive theory to satisfy. Critical realism has been demonstrated as appropriate for investigating IS phenomenon, and revealing new insight (Mingers et al. 2013). Views of theory and theory choice in critical realist research are less well-known in the IS discipline. The purpose of this paper is to articulate from a critical realist perspective an overview of what theory is, its implications and contributions. Specifically, the paper focuses on the issue of theory choice in critical realist middle-range theorizing. The paper illustrates how theories were chosen in a critical realist study of emergent usage of adaptive IS. To focus the paper, we ask the following questions:

- (1) What is the general view of theories and their implications in critical realist research?
- (2) How can scholars select and integrate theories in critical realist middle-range theorizing?

The rest of this paper is organized as follows: Section 2 consists of a brief overview of critical realism; Section 3 gives a general overview of theories and their implications in critical realist IS research. Section 4 presents how scholars can select and integrate theories in critical realist research and Section 5 illustrates an example of theory choice in a critical realist case study of emergent usage of adaptive IS.

## **2.0 Critical Realism – An Overview**

Critical realism subscribes to the notion of an objective reality that is independent of our descriptions and knowledge (Mingers et al. 2013). While our ideas about the reality may change over time, reality itself does not change with our changing thoughts and is stratified into three domains - the real, the actual and the empirical (Bhaskar 2008). The domain of the real contains structures, their relations and generative mechanisms all in a constant state of flux (Mingers 2010). When such mechanisms are triggered, events may or may not be actualized. When actualized they may or may not be observed at the level of the actual. They may be observed in the form of their effects that carry traces of their causes at the empirical domain (Bhaskar 2008). Mechanisms have causal powers and enduring properties that when triggered under specific conditions produce different outcomes (Smith and Johnston 2014). Therefore, the same mechanisms are prone to produce different social phenomena under different conditions within a historical context. Knowledge of such reality is also stratified, transformative and can be conceived of as a social product (Bhaskar 2008; Souza 2014). Thus, critical realism takes an epistemologically relativist stance that acknowledges the social construction of knowledge about the mind-independent reality

(Bhaskar 2008). It also acknowledges the fallibility of all knowledge. Thus, knowledge is historically temporal, and it acquires meaningfulness and value relative to space, time and the social-practice position of the knower (Arvanitidis 2006; Souza 2014). Such knowledge is also situated in a historical and cultural discourse that favours certain knowledge claims over others via a process of judgmental rationality (Bhaskar 2008; Souza 2014).

Judgmental rationality captures the shared reference points for making rational choices between alternative theories (Isaksen 2016). Ignoring judgmental rationality “renders problematic the idea of a rational choice between ‘incommensurable’ theories and to encourage (superidealist) skepticism about the existence of a theory-independent world” (Bhaskar 1998, p. x-xi) Alternative theories are not just different in their suppositions as suggested by Walsham (1993), but are incommensurable theories about the same world (Bhaskar 1998). Thus, they are understood to compete and conflict in their claims to advance upon established explanations about the reality in question (Bhaskar 1998).

Critical realism subscribes to open systems where temporal, non-universal and invariant patterns of regularities exist as demi-regularities (Lawson 1997). Within the open systems, micro entities interact to form a variety of social objects that possess emergent powers (Ononiwu and Brown 2013). Equally, there is an integration of micro-level and macro level dynamics to connect the real with the empirical domains in the open system. By this, emphasizes shifts to unobservable causal mechanisms at the real domain rather than deterministic causality at the level of the observed events. A critical realist explanation thus involves a gradual transition from the observed events through reasons (actors’ accounts) to rules and thence to structures based on retroductive mode of reasoning (Mingers et al. 2013; Sayer 1992).

Structures are real with causal powers but may not be actualized and they manifest in the form of material, ideals, artifacts and social objects (Fleetwood 2005). Social structures do not exist independently of an agents’ conception of their effects (Fleetwood 2005). That is, social structures manifest through the activities they govern and, as such, cannot be directly observed (Fleetwood 2005). They have an intransitive dimension (the presupposition of the real in the form of enduring structures and mechanisms) and as a result function independently of their appropriate

conceptualization (Arvanitidis 2006). Being regarded as the ever-present condition and also the outcome of human agency, social structures at any moment in time are pre-given for individuals who do not create them, but merely reproduce or transform them in their substantive activities (Archer 1995). Thus, we do not make social structures: they pre-date us having properties and powers that have emerged as a result of actions taken by our predecessors (Archer 1995). Thus, in a transcendental and causal manner, social structures become the necessary condition for human behavior and action. By the causal powers of social structures, we proclaim their reality and also by their pre-existence, we establish their relative autonomy as distinct objects of scientific investigation (Arvanitidis 2006). Consequently, the ontological and methodological separability of social structures and human agencies is recognized with distinct emergent properties and causal powers (Archer 1995; Arvanitidis 2006).

Since, critical realism assumes that “a cause is whatever is responsible for producing change” (Sayer 2000, p. 94), causal explanatory theories become the goal of realist researches. Such theories ought to capture the mechanisms and their interaction that cause the event. Thus, constant conjunction of events is neither a sufficient nor a necessary condition for a causal explanation. Rather, it can at best support the identification of events in the empirical domain (Ononiwu and Brown 2013). Causal explanation focuses on “finding or imagining plausible generative mechanisms for the patterns amongst events” (Harré 1972, p. 125), leading to “the postulation of a possible mechanism. Thence, we can attempt to collect evidence for or against its existence, and the elimination of possible alternatives” (Outhwaite 1987, p. 58). From a critical realist perspective, to understand the real domain is the reason for science (Bhaskar 2008). Theorization then becomes the means to explain why an event occurs via a retroductive-based transcendental process (Bhaskar 2008). Such a process occurs when we use the observed event as a symptomatic clue to fallibly infer the type of mechanisms that lies beyond the observed events (Mingers et al. 2013).

### **3.0 Theories and their Implications – A Critical Realist Perspective**

There is a lack of consensus as to what constitutes a theory. Consensus exists that theories are made up of ideas called concepts and propositions that describe, explain or predict phenomena (Gregor 2006). Consensus also exists that theories vary in levels of abstraction- grand theories are

more abstract than middle-range theories (Gregor 2006). In critical realist IS research, theories are seen to be models that specify “the tendencies of transfactually active mechanisms, which co-determine particular concrete events or phenomena” (Bhaskar and Danermark 2006, p. 283). Such a definition presupposes that theories are causal models that are historically context-specific. It emphasizes a shift in focus from deterministic explanations of the observed events to explanations of the enabling conditions and generative mechanisms (Rogers 2015). “Generalization, in this view, is not legitimated by the empiricist’s collection of positive instances of correlations but through the development and elaboration of theories of causal mechanisms and models” (Rogers 2015, p. 228). Mechanisms rather than variables become the building blocks of theory leading to the development of domain-specific ontological theories (Cruickshank 2003; George and Bennett 2005).

The implication is that theory now provides a causal understanding that enables researchers and indeed practitioners to understand the situated meaning of actions, rather than the cataloguing of behavioral measures that describe such actions (Rogers 2015). To develop such theories within the realm of IS, pre-existing theories may be subjected to immanent critiques (i.e., critique of theories using their own standpoint) probing into the question of whether the pre-existing theories at hand offer adequate and consistent accounts of the reality they purport to explain in the IS phenomenon studied. Theories therefore, become tools ready to be used, and also as constructions in a state of flux (Bhaskar 2008). The tool view of theory (background theory) captures the background functionalities of theories as pre-existing social products used to produce knowledge about why/how things happen in a vague phenomenon (Bhaskar 2008; Mason and Waywood 1996). Bhaskar classified such a background theory as “*produced means of production*” (Bhaskar 2008, p. xvi). The under-construction view of theory (foreground theory) captures the foreground functionalities of theories as local theories in-view, undergoing development processes in order to answer a specific research question (Mason and Waywood 1996).

On one hand background theories allow researchers investigate facts and phenomena by providing the tools for design, and the language to observe, understand, describe and explain phenomena. The underlying dualist view of background theories positions us to account for theories as a means to explain complex situations as well as a system of concepts that affect how we see the

phenomenon studied. Thus, background theories help us to understand what are taken to be the things that can be questioned and what counts as an answer to that questioning (Mason and Waywood 1996). Since research aims, questions, objects and methods of investigation are theory-laden, background theories help us to commit to specific kinds of aims, questions and methods of investigation. There are ontological gaps between the intransitive dimension and the transitive dimension (knowledge domain of conceptual elaborations) (Bhaskar 2008). Thus, background theories are used to fill such gaps and constitute the tools used to mediate into the intransitive dimension we do not have immediate access to in a practical sense. Therefore, background theories mediate between the real world and our empirical experiences of it. By doing so, they become our provisional method for making our way into the real world, resulting in their transformation into a deeper knowledge of the real world (Ononiwu and Brown 2013). Dissecting the nature of the background theory helps us to account for the theory's ontological affinity with the realist paradigm the researcher brings into the research given the theoretical account of the phenomenon studied (Pozzebon 2004). Considering the theory's upholding of ontological affinity assists in answering the question: Does this background theory fits with the critical realist assumptions the researcher is bringing into the research? It is highly uncertain that "researchers will be able to make effective use of theory unless they feel an affinity for the vision or worldview embedded in that theory" (Anderson et al. 2005, p. 515).

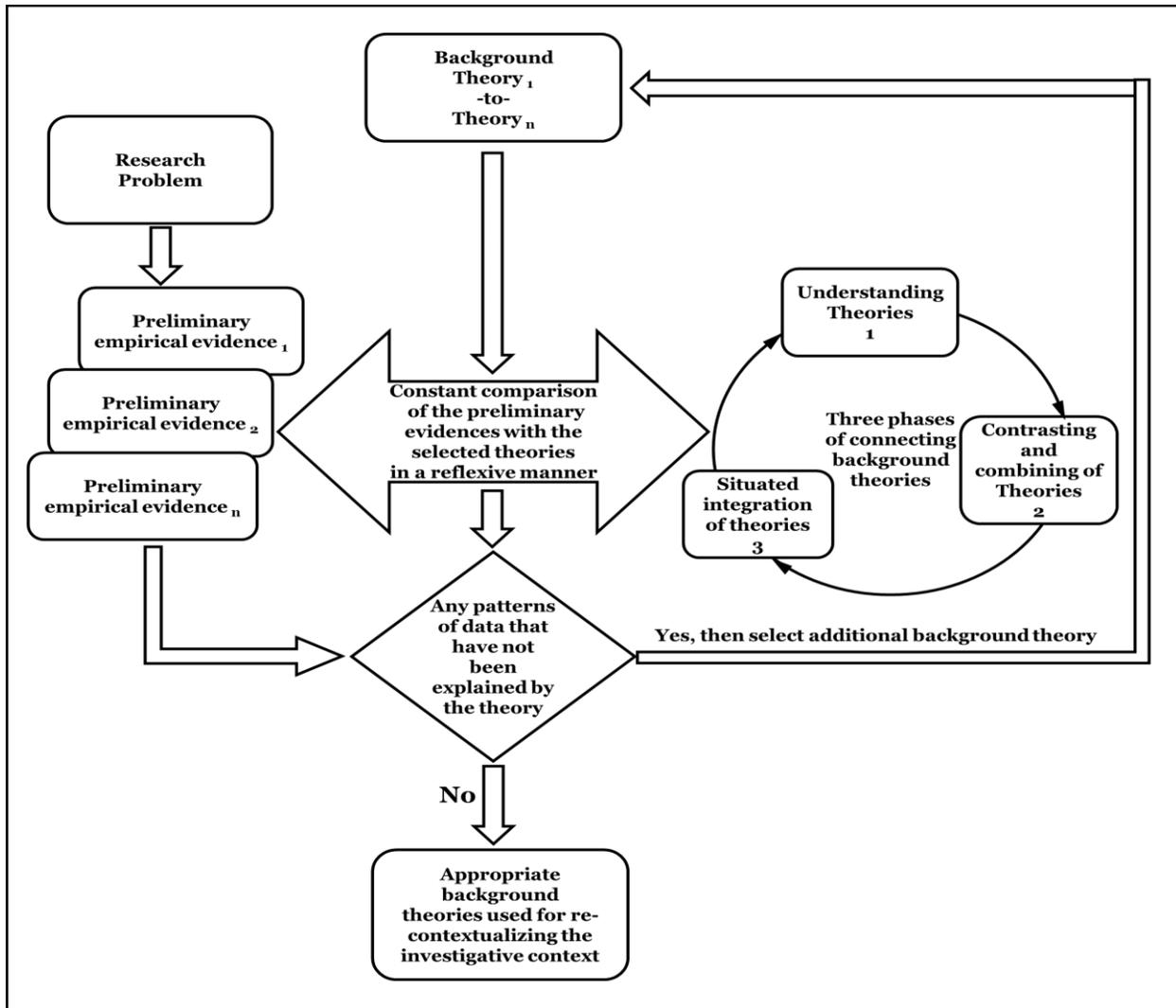
On the other hand, foreground theory can be seen as an ontological "*product-in-process*" embedded in the practical work of researchers (Bhaskar 2008). Such a theory is domain-specific, cognitive, transient and the socio-historical material of a scientific practice. It is a product of a particular, ongoing and open-historical research endeavor (Bhaskar 2008). A foreground theory developed along these lines comes with some notable merits and implications in IS research. Being elaborated in accordance with the critical realist tenets, theories will incorporate the interplay between artifactual structures of IS and social structures, including processes of reproduction and transformation of such structures. Thus, the knowledge of both background and foreground theories and their implications amplify the fact that theories have dialectic roles of not just guiding research practices within the confine of their embedded philosophical underpinnings- they are also influenced by research practices as well as being the products or the aims of research practices (Prediger et al. 2008).

#### **4.0 Theory Choice in Critical Realist Middle-Range Theorizing**

There are challenges of theory choice when a diversity of background theories is to be used during a research endeavor. Such challenges are associated with: (1) the difficulties of understanding different theoretical frameworks in-depth because of their different backgrounds, languages and implicit assumptions, (2) the difficulties of integrating the empirical results that emanate from different theoretical perspectives, and lastly, (3) the difficulties of improving the scientific progress by building upon empirical research that emanates from different theoretical frameworks that are sometimes incompatible and which even produce contradictory results (Prediger et al. 2008). Despite these challenges, some critical realists advocate for a diversity of theories to be used (Bhaskar 2013; Isaksen 2016). Other critical realists argue for the use of a single theory (Dobson 1999) while recognizing that a single theory both illuminates and conceals. As such, it is helpful to apply a diversity of theories to empirical evidence. As a multi-disciplinary field IS research routinely uses insights from psychology, sociology, economics and many other disciplines to develop explanations that help us understand specific IS issues. There is growing interest in using multiple theories in discrete IS investigations to address this multidisciplinary holistically. Re-contextualizing IS phenomena using different background theories can provide novel insights. Besides, the complexity of IS phenomena are increasing, due to the entwinement of technology into everyday life, organizations and society (Yoo 2010). Because “we are prisoners in the cave of our theories” (Bhaskar 2008, p. xii), a single background theory is often insufficient to explain the multifaceted digital reality as it becomes ever more woven into our ways of doing (Yoo 2010).

Use of diverse background theories allows for gaining deep, complex and varied insights into the empirical and conceptualized phenomena. It sharpens theory development through: (1) building new concepts, (2) posing new questions, and (3) making explicit commonalities, while keeping the theories’ specific identities. It also provides a wider scope to compare and contrast data from different versions of the same reality when guiding data analysis. However, deploying a diversity of theories comes at a cost of selecting the most appropriate theories. Walsham (1993) suggests that there is no need for theory choice among a diversity of background theories since no one theory is “better” for use in an empirical situation. This is because of the belief that all theories are equal and ‘reality’ is what people say it is. This belief stems from a constructionist notion of

judgmental relativity and the rejection of the possibilities of knowing a non-subjective, non-discursive reality (O'mahoney and Vincent 2014). In contrast, critical realism advocates for better theories judged on the basis of their explanatory powers by invoking the concept of judgmental rationality as a reasoned discrimination between competing theories in their context of use (Lopez and Potter 2001; Peacock 2000). As pointed out by Lopez and Potter (2001) “[w]e can (and do!) rationally judge [or choose] between competing theories on the basis of their intrinsic merits as explanations of reality” (p. 9). However, critical realist IS literature does not make clear how to “go about” selecting appropriate background theories among competing ones. We therefore propose a model as shown in Figure 1 to guide researchers in making fallible and contextual theory choices to overcome performative contradictions associated with the mismatch between theory and empirical evidence (Smith 2006).



**Figure 1. A model for selecting background theories**

The process shown in Figure 1 represents a background theory selection process. It draws from an abductive mode of reasoning as a means of creative insight to engage with the given phenomenon studied (Ononiwu and Brown 2013). It first starts by using disconfirming preliminary empirical evidence of the observed phenomena to constantly compare with the assertions of the background theories (Van de Ven 2007). Given the theory-laden nature of observations, constant comparison with reflexivity is done to capture theoretical fitness with the data (Van de Ven 2007). Thus, from the observed properties, we reason our way toward theories with the hindsight that the observed empirical evidence represents symptomatic signs of the underlying mechanisms in interactions to form empirical traces (Bhaskar 2008). Such traces are context-dependent, subjective, theoretically laden and capture the different versions of the events that arise due to the underlying mechanisms

in interactions (Smith and Johnston 2014). The cycle continues by bringing in other background theories until the preliminary empirical evidence is exhausted and the theories that have the most significant explanatory powers in the context are selected. To connect multiple competing background theories for matching with the series of the initial empirical data three phases are considered namely: (1) understanding the theories, (2) contrasting and combining theories and (3) integrating theories in the empirical situation. Each phase will be discussed in turn.

#### **4.1 Understanding Theories**

All attempts to select theories must start with the understanding of the background theories. As Figure 1 attests, being the first phase, the theory's assertions and concepts should first be well understood for us to use it for problem conceptualization. Using background theories as a means of problem conceptualization is when we prescribe a particular way of forming ideas and notions about the phenomena studied, which makes it possible to consult theories that align with the empirical investigation (Ochara 2013). By drawing from literature of what we know about the background theories, an immanent critique is brought to bear to understand their strengths and weaknesses (Isaksen 2016). As we continue to adopt an immanent critique process we will understand the core and empirical components of the theory and its application areas. The core components of the theory include its basic foundations, assumptions and norms which are sometimes taken for granted. The empirical component consists of concepts in relations. As in the case of some grand social theories, due to their unbounded and encompassing abstraction of concepts, there may not be relations (Hassan and Lowry 2015). The empirical components determine the theory's content and its usefulness through its application in research (Prediger et al. 2008). For example, actor network theory (ANT) having stemmed from a social constructivist foundation (Elder-Vass 2015) does not permit any researcher to subject it to statistical or variable-centered type of theorizing when investigating a new IS innovation. Rather, such a researcher adopts an interpretive methodological perspective to pay attention to ANT's call to follow the key-actors' interactions, i.e., to follow the IT artifact as it is rolled out through ANT's concepts of inscription, enrollment and translation. Besides, ANT's core components of generalized symmetry, where human and material actors are viewed as on the same plane, prioritizing the trace of the social actors' connections at the expenses of the causal role of such social interactions makes ANT incommensurable to critical realist assumptions (Elder-Vass 2008). Based on such

incommensurability, it is generally advised not to use ANT in critical realist IS research. Thus, understanding background theories on the basis of their core and empirical components is a precondition for selecting them, and at the same time, a successively deeper understanding is also a requisite aim of selection attempts (Prediger et al. 2008).

#### **4.2 Contrasting and Combining Theories**

As more and more preliminary empirical evidence is added, background theories continue to be compared with respect to: (1) their general approach to the research objectives within the limit of their functions, (2) the role of their core and empirical components, (3) their enactment in the analysis of the empirical evidence, and (4) generally, their articulation on the practice of empirical research they are applied to (Prediger et al. 2008). Thus, multiple viable explanations for empirical evidence begins to emerge. Judgmental rationality is then used to weigh the adequacy of the competing theories and arrive at the one that most likely leads to a valid and useful explanation. Contrasting strategy is used to discover the individual theories' differences and the nexus of their combination with regards to the empirical evidence. Thus, specificity of each theory and their possible connections can be made more visible through contrasting. Theories are then combined through juxtaposition or triangulation based on their similarities and their differences since they each have their limitations in understanding any empirical phenomena (Prediger et al. 2008). Depending on the research objective, theories with compatible core and complementary or non-complementary empirical components are selected to reflect the different elements of the empirical phenomenon. Careful analysis of their mutual relationship is carried out with the view of integrating the chosen theories.

#### **4.3 Integrating Theories in The Empirical Situation**

The chosen background theories are not just juxtaposed to offer different perspectives of the phenomenon (Walsham 1995), but they are integrated (Danermark et al. 2002; Dobson 2001). They constitute the analytical frames and are synthesized and integrated through the process of theoretical redescription (Downward et al. 2002). Theoretical redescription is the use of selected background theories to re-contextualize the phenomenon studied into a new context (Downward et al. 2002). By re-describing the phenomenon, we can discover the operative mechanisms and evaluate the explanatory power of such mechanisms at stake in the light of the empirical evidence

and compared them with those postulated by the selected theories (Danermark et al. 2002). By doing so, the embryonic research model that explains the phenomenon emerge subject to further refinement with more and more observations in the investigative context (Pawson and Tilley 1977).

It is useful for analytic purposes to separate out the three phases of connecting theories, but their activation in practice can vary and often all of them are used at the same time. As illustrated in Figure 1, the process continues in an iterative and reflexive fashion until the researcher exhausts the preliminary empirical evidence reflecting the IS phenomenon being studied.

## **5.0 Illustrated Example of Theory Choice Process**

To make our view less abstract, we provide an example of how background theories are selected using the process shown in Figure 1. The illustration is from a critical realist case study that investigated emergent usage of adaptive IS. Our ultimate goal and contribution is in offering theoretical guidance on how to select theories with significant explanatory powers to investigate IS phenomena, while aligning to critical realism tenets. As per the model of Figure 1 we start by delineating the research problem.

### **5.1 Research Problem**

Adaptive IS are systems that change in the face of perturbations (e.g. user requirement changes in task accomplishments) so as to maintain some kind of invariant state by altering system behaviors or modifying the system environment (Arkin 1998). They are highly interactive systems suited to support user engagement and service consumption experience. Their effective functioning mainly depends on user-system interactions that involve tweaking, modification, appropriation, and embodiment of the system while-in-use in an aesthetically-enriched environment. While such kind of usage occurs, the system evolves with new structures to support user requirement changes (Fischer and Herrmann 2011). Such usage is classified as emergent and is defined as a post-adoptive behavior in which users modify IS in their context-of-use based on their direct engagement and experience, to meet personal relevance in ways that were not planned by designers. The IS emergent use epitomizes the capacity of users to alter a software artifact and its meanings through diverse practices, interactions, and dynamic interpretations in the form of

adaptation (a change in the meaning of the artifact and the ways in which it is used) and/or reinvention (a transformation of the meaning, the use, and the structure of the artifact) (Siles and Boczkowski 2012; Straub and del Giudice 2012). The pervasiveness of emergent IS use is not in doubt. What is of interest is why emergent usage occurs with adaptive IS? or what generative mechanisms must exist for such emergent usage to be possible?

The latter research question infers that the goal of the research is causal explanation. Causal explanation is a goal for certain types of theoretical studies (Gregor 2006). Causal explanation is rarely discussed in-depth in IS literature (Hovorka et al. 2008), especially when it takes the form of mechanism-based explanations involving causal detail of why an IS phenomenon has happened (Avgerou 2013; Markus 2014). Therefore, a causal mechanism-based explanation of why emergent use of adaptive IS occurs is the aim of the research.

## **5.2 The Preliminary Empirical Evidence and Literature Review**

A case study approach was used to conduct the investigation. A web-based adaptive financial system developed and deployed by a financial service provider for public use was the investigative context. Emergent usage of this system constitutes the observable IS event at the empirical domain (or the demi-regularities) in the investigation (Lawson 1997). Since the emergent usage of the adaptive IS cannot occur without the original design supporting the notion of new purposes of use, the design activities were also included in the investigation.

The case (i.e., emergent usage of adaptive IS for e-financial services) was the primary unit of analysis within this single case; however, attention was also given to the social actors' experiences, perceptions, apperceptions, and actions in the system as sub-units (Miles and Huberman 1994; Paré 2004). The social actors' experiences, perceptions, apperceptions, and actions provided cues of what seems to have caused the emergent usage of the system to occur over a period of time. The social actors were the managers and software designers in the case organization, as well as officers of banks, grocery shops, other financial institutions (insurance companies) and '*prosumers*' or active users outside the organizational context (Tapscott and Williams 2006). In their respective constituencies, these actors made up the interdependent elements that created the emergent IS usage event, by reason of their interactions (Fischer and Herrmann 2011). The unit of analysis also set the operational boundaries of the theory that was to be developed and it clearly and directly associated with the research question (Paré 2004; Yin 2009).

In the light of the data that we collected and analyzed, we went to literature and identified for review about 150 papers related to the phenomenon, including papers in the grey literature and practitioner publications. Thematic analysis was used to abstract, and group concepts based on perspectives of how the phenomenon has been covered in IS or other related fields. Thus, the article search was extended beyond IS to include related disciplines such as human-computer interaction and organizational science.

Based on critical realist guidelines for synthesizing literature (Okoli 2012; Rycroft-Malone et al. 2012), we developed a critical realist conceptual framework related to emergent usage of adaptive IS. The high-level categories of the framework were: enabling structures, dynamic mechanisms, control mechanisms, and enabling causal conditions. Concepts arising from the literature review were incorporated into each of these categories where relevant. The identified concepts under enabling structures were: embeddedness and under-design (Fischer and Herrmann 2011; Volkoff et al. 2007), information asymmetrical structures of financial institutions (Barbaroux 2014; Kau et al. 2012) and organizational structure (Alaa 2009; Patel 2012). Dynamics mechanisms were: misfit and workarounds (Alter 2014; le Roux 2014), technological cognizance (Nambisan et al. 1999), technology mediation (Verbeek 2006; Zhu et al. 2010), system affordances (Markus and Silver 2008), and trust-distrust dialectics (Alaa 2009; Benamati et al. 2003; Kupreychenko 2013), while the enabling conditions were: personal innovativeness in IT (PIIT) (Agarwal and Prasad 1998), situational abnormality and suspicion (Moody et al. 2014; Pavlou et al. 2007). The control mechanisms were: critiquing, reflection and learning (Fischer and Herrmann 2011; Giaccardi and Fischer 2008). The identified concepts and their interactions summarized a set of patterns that suggested the outcome - emergent usage of adaptive IS. They do not guarantee that such an outcome will occur in our context, but they tend to explain it as corroborated by the initial empirical evidence, when applied retrospectively to data using abductive reasoning. Thus, we used the concepts identified from literature to offer novel explanations of the phenomenon, and theoretical relationships which had hitherto been unexplained.

### **5.3 Theory Choice**

At this stage there is need for a background theory or theories that could help us to infer the casual relationships, clarify the meaning of the unobserved mechanisms and delineate the IS phenomenon. Such theories should provide *a posteriori* plausibility for the retroductive

hypothesizing of the causal relationships in the investigative context. That is, theories we can draw from to retroductively hypothesize that the identified structures, mechanisms, enabling conditions and their interactions exist and they are what produced the emergent IS usage in the context. Retroductive hypothesizing or theorization is a process of developing hypotheses by the use of “theories that seek to provide causal explanation of what has not necessarily been empirically deduced or induced, but has been synthesized and inferred from available empirical data and related concepts” (Kempster and Parry 2014, p. 91).

In our retroductive theorization of the IS phenomenon under investigation we considered three theories: (1) sociomateriality (Orlikowski and Scott 2008) (2) complex adaptive systems (CAS) theory (Merali 2006; Nan 2011) and (3) meta-design (Fischer and Herrmann 2011; Giaccardi and Fischer 2008). The choice of these theories is because they: (1) possess potential coherence with the concepts seen as structures and mechanisms from the synthesized literature, when placed in the light of the initial empirical evidence of the research, (2) offer explanations that recognize the socio-materiality of the technology when explaining how or why people use IS in emergent ways, and (3) delineate the micro-interactions of structures, mechanisms and agency (both IT agent and human) for emergent order to occur.

#### **5.4 Understanding the Candidate Theories**

We rendered an immanent critique of the selected background theories (Bhaskar and Hartwig 2010), and in so doing identified the strengths and weaknesses of each theory in the light of the empirical evidence. In the end, sociomateriality theory was seen to be less suitable, while CAS and meta-design were found to be compatible and better suited as candidate background theories. The reasons are presented next by firstly discussing sociomateriality in relation to the empirical situation, then CAS and meta-design.

##### **Sociomateriality**

By particularizing the theory in the initial empirical analysis, it was found that:

- (1) the theory does not take into account the causal efficacy of material agency and the embeddedness of social structures into software artifacts (Al Lily 2013; Leonardi 2013). When sociomateriality theory is extended to emergent IS use, it only captures IS use as performativity in practice and as such the causal essence of the pre-existed artifactual structures evident in the context will not be accounted for (Cuellar 2010; Jones 2014). Material agency includes the tangible technical objects,

intangible stuff, such as data and algorithms as well as the inscribed digital artifacts (Kallinikos et al. 2013; Leonardi 2012).

- (2) the concept of structure exists as material-cum-social in an interpenetrative realm of inseparability. Thus, the theory will not reflect how artifactual structures of the technology or IS structures in socio-technical format are positioned in the investigative context. IS structures are seen as material and/or ideations (media content) with their own casual powers which exist in relation to the social (Leonardi 2012; Mutch 2013).
- (3) there is an absence of temporality in sociomateriality theory (Jones 2014; Leonardi 2013; Mutch 2013). This made it difficult to understand how emergent IS usage was sustained and evolved over time.
- (4) the linkage of individual micro-level action and macro-level institutional processes has received little attention in the sociomaterial literature (Jones 2014). Thus, researchers could be “misled into overlooking the important interactions of the IT artifact with its internal and external environment” (Tiwana et al. 2010, p. 677).

### **Theories of CAS and Meta-design**

Theories of CAS and meta-design have common underlying assumptions in their cores and thus, we considered them together here. Both theories share conceptual proximity with the IS phenomenon (Okhuysen and Bonardi 2011). By means of immanent critique (Bhaskar and Hartwig 2010), theories of CAS and meta-design suggest a fit with the initial empirical evidence based on:

- (1) the support for causal efficacy in material agency and the embeddedness of social structures into software artifacts as IT agents (Fischer and Herrmann 2011; Nan 2011). Both theories conceptualize emergence as a process that accounts for qualitative novelty (Fischer and Herrmann 2011; Nan 2011). Based on this, it empowers the researcher to look at the system’s emergent usage as an innovative or reinvention process with unpredictable outcomes. The theories also empower the researcher to consider emergent IS usage as a set of dynamic and adaptive interactions. Emergent interactions among autonomous entities (i.e., individual, organization, environment, software artifact) and their self-reinforcing mechanisms are accounted for by both theories (Fischer and Herrmann 2011; Nan 2011). Consequently, such usage can be theorized at the individual level, without ignoring the organizational and environmental impacts associated with the technology’s situatedness.
- (2) From the initial empirical evidence, it was seen that to theorize emergent usage of the technology demands an understanding of the designers’ activities, the interaction of the users as secondary designers, the software artifact, the service contents, and the context, as they altogether evolve (Fischer and Herrmann 2011; Hovorka and Germonprez 2008). Theories of CAS and meta-design suggest each of these latter components can be viewed as agents in interactions (Hovorka and Germonprez 2008).
- (3) Both theories of CAS and meta-design have a high degree of commonality in that their tenets originated from socio-technical systems thinking (Fischer and Herrmann 2011; Mingers 2014). They resonate well with the phenomenon of interest. They share the same semantic commensurability in ascribing causal powers to structures and mechanisms. Both theories support sociomateriality ontology, but treat “materiality as existing in the realm of structure and social action as existing in the realm of action and both can relate with one another” (Leonardi 2013, p. 66). Because of such relations, we can understand that artifactual structure and human agency are both emergent strata of social reality with *sui generis* properties and powers in a specific and open context where the technology is situated (Archer 1995; Mutch 2010). Technology in this view is not static, but exercises a great deal of flexibility. It emerges in practice by reason of the interactions

between people, materiality of IT, and institutional environment at certain points in time (Fischer and Herrmann 2011; Leonardi 2011; Nan 2011).

## **5.5 Contrasting and Combining Theories**

The core and empirical components of the three theories in relation to the initial empirical evidence and critical realist presuppositions were examined. The sociomateriality concept is embodied in the core of all three theories (Fischer and Herrmann 2011; Jones 2014; Nan 2011), but may not in some cases share the same ontological assumptions. Sociomateriality (Orlikowski and Scott 2008) shares a relational ontology with CAS, but there are subtle and distinct nuances that compel both theories not to be used in the same research. The relational ontology of sociomateriality stems from inseparable entwinement of humans and technologies while ignoring their inherent properties. The properties are acquired by emergent entanglement through performativity. Thus, reality is not given but performed through relations in practice and emergence arises through agential intra-actions (Barad 2003; Orlikowski 2010). Through such intra-actions material-discursive practices form relations to enact their particular properties without first not being self-essential entities in interaction (Cecez-Kecmanovic et al. 2014; Jones 2014).

Theories of CAS and meta-design share a relational ontology with sociomateriality theory (Fischer and Herrmann 2011; Hassan 2014; Nan 2011). However, their relational ontology arises through autonomous and self-essential entities in interaction (Giaccardi and Fischer 2008; Mingers 2014), in contrast to agential intra-actions as in sociomateriality (Jones 2014; Orlikowski 2010). CAS recognizes the pre-existing self-essential entities (human and technologies) that sociomateriality theory denies (Byrne 1998; Cecez-Kecmanovic et al. 2014). Such entities involve themselves in dynamic and synergistic interactions to form emergent order in a self-organized fashion (Curseu 2006; Fischer and Herrmann 2011; Merali 2006). Meta-design theory, being a substantive theory that is crafted from socio-technical systems thinking endorses an objective reality similar to CAS (Fischer and Giaccardi 2006; Merali 2006). The reality exists by emergence with powers and *sui generis* properties irreducible to the constituent parts that interact to form it in a specific and open context. Thus, relations that produce social objects or phenomena in CAS and meta-design's view arise from the interweaving of human and material agencies in interactions (Nan 2011), in contrast to the intra-action concept of sociomateriality (Barad 2003; Orlikowski 2010). To CAS emergent behavior is unknown in advance, but is observable at the macro-level in the form of regularities

(Antoniou and Pitsillides 2007; Nan 2011). To explain interactive relations in a relatively enduring motion of change overtime, theories of CAS and meta-design introduce the concept of reciprocal causal mechanisms. In CAS theory it is called feedback systems (Alaa 2009; Merali 2006), while in meta-design theory it is called critiquing systems (Giaccardi and Fischer 2008).

CAS and meta-design while being compatible, each have a few distinct perspectives which when combined yield insights that each perspective alone cannot provide. For instance, CAS theory in its pure form does not cover emergent behavior that pertains to IS use or explain the coevolution of behavior and technology (Sedera and Zakaria 2008). Another major critique of CAS theory is that it has abstract and broader concepts that do not explicitly capture context-specific mechanisms despite being manifested within different relationships of mechanisms that also influence its evolution (Nan 2011). Thus, CAS theory is adapted in this research context and further fortified by incorporating meta-design theory that has concepts that specifically cater for emergent IS usage and the adaptive nature of systems (Fischer and Herrmann 2011).

The empirical components of sociomateriality theory and its application area suggest a posthumanist view where reality is created by performativity or discursive effects (Cecez-Kecmanovic et al. 2014). Agency is neither in humans nor in technologies, but in enactment of iterative changes to particular practices through the dynamics of intra-activities of humans and technologies (Barad 2003; Orlikowski 2010). Thus, there is composite assemblages of humans and technologies only by ontologically inseparable components in intra-actions (Barad 2003; Orlikowski 2010). Consequently, the theory is suitable for descriptive studies rather than explanatory since it precludes an examination of 'becoming' (Jones 2014; Leonardi 2013). Sociomateriality shifts its focus to what 'is' (Jones 2014; Leonardi 2013) since "relations and boundaries between humans and technologies are not pre-given or fixed, but enacted in practice" (Orlikowski and Scott 2008, p. 462).

In contrast the empirical components of theories of CAS and meta-design hold assumptions that are consistent with an objective reality independent of knowledge, similar to critical realism (Fischer 2007; Mingers 2014). Such empirical components empower the researcher to embrace emergence, self-organization, diversity, historicity and contingency of actors' experiences with the

technology. Data is collected to unveil webs of causation, rather than relying on simple linear relationships that epitomize the traditional reductionist framework (Tredinnick 2009). Data collection and analysis along these lines are plausible, because actors and users of technology do not perceive technologies and humans (social) as interpenetrated entities that can only be perceived by instantiations (Leonardi 2013). By virtue of steering a course between induction and deduction, theories of CAS and meta-design support the critical realist multi-pluralistic retroductive method and the theoretical sense required to answer the research question (Byrne 1998).

### **5.6 Integrating Theories in the Empirical Situation**

Theories of CAS and meta-design are selected and combined based on their explanatory powers in the initial empirical evidence, the commensurability of their core and empirical components, and their concordance with critical realism tenets. In this phase, they are integrated with the conceptual framework synthesized from literature in the light of the initial empirical evidence through theoretical redescription (Danermark et al. 2002). From the theoretical redescription, we abstract an embryonic theoretical model of emergent IS usage as a kind of working hypothesis (Pawson and Tilley 1977). To refine the model, it is compared with images which are constructed from empirical observations via an explanatory case study (Easton 2010; Miller and Tsang 2010). The data analysis plan utilizes codes based on the embryonic theoretical model by using counterfactual reasoning to argue towards transfactual concepts behind the data, differentiating between constitutive concepts and accidental circumstances (Meyer and Lunnay 2013). Counterfactual reasoning makes use of previous knowledge and direct empirical observations or experience in the phenomenon to explore the motives behind the data, by questioning: “how would this be if not . . . ?” “Could one imagine what must have prompted the analytic themes in the data?” (Danermark et al. 2002, p. 101). This ultimately leads to the development of a new foreground theory that is equally aligned with the empirical data, as well as generalizable analytically (Tsang 2013). The newly developed foreground theory offers a fallible mechanism-based explanation of why emergent IS usage occurs in the investigative context. Therefore, the use of theories is not limited to problem formulation and the literature review—they also guide the study throughout the research all the way through to development of a theory that is a contribution to knowledge concerning the phenomenon under investigation.

## **6.0 Conclusion**

The paper has provided a general overview of theory and its implications from a critical realist perspective. It has also demonstrated the process of critical realist middle-range theorizing in IS. The model developed to guide theory choice provides for selection of background theories that have appropriate fit with the methodological plan in critical realist IS research. It also allows for development of theory as an outcome of analytical engagement with data, leading to foreground theories. The model empowers the researcher to select background theories based on their explanatory powers in order to build an argument, establish the context of the problem, and explain findings. Such theories provide for a theoretical contribution by way of using background theories to justify the research questions, conceptualize the problem, and determine the research design and the data analysis plan to make sense of the phenomenon. Thus, rather than inappropriate overemphasis on theories that can constrain the accumulation of knowledge, our model provides for a process of critical engagement with theories in the light of the empirical evidence, subject to the specific research questions to be addressed.

The model offers a contribution to critical realist research in IS, a philosophy which has only recently been introduced to the discipline. It illustrates the abductive and retroductive approach to theorizing in critical realist research, which is different from the more well-understood deductive, inductive or solely abductive modes of inference. The model offers guidelines as to how to select appropriate background theories through the critical realist notion of engaging in an immanent critique of theories.

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