METHODOLOGICAL IMPLICATIONS OF CRITICAL REALISM FOR MIXED-METHODS RESEARCH

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Building on recent developments in mixed methods, we discuss the methodological implications of critical realism and explore how these can guide dynamic mixed-methods research design in information systems. Specifically, we examine the core ontological assumptions of CR in order to gain some perspective on key epistemological issues such as causation and validity, and illustrate how these shape our logic of inference in the research process through what is known as retrroduction. We demonstrate the value of a CR-led mixed-methods research approach by drawing on a study that examines the impact of ICT adoption in the financial services sector. In doing so, we provide insight into the interplay between qualitative and quantitative methods and the particular value of applying mixed methods guided by CR methodological principles. Our positioning of demi-regularities within the process of retrroduction contributes a distinctive development in this regard. We argue that such a research design enables us to better address issues of validity and the development of more robust meta-inferences.

Keywords: IS research, critical realism, retrroduction, mixed methods, qualitative and quantitative methods, econometric modeling, qualitative enquiry

Introduction

The growing diversity in information systems (IS) research and the increasing popularity of mixed methods approaches, involving the use of both qualitative and quantitative methods in the same research endeavor, has motivated many scholars to explore different research design strategies and alternative theories to ground this new methodological movement (Benbasat and Weber 1996; Landry and Banville 1992; Lee 1999; Mingers 2001; Ridenour and Newman 2008; Robey 1996; Venkatesh et al. 2013). Traditional paradigms of IS research

1 John Mingers, Alistair Mutch, and Leslie Willcocks served as the senior editors for this special issue and were responsible for accepting this paper.

2 The terms mixed-methods, multimethods, and triangulation are often being used interchangeably in IS and in social sciences literature generally. In this paper we use the term mixed-methods to highlight the combination of qualitative and quantitative methods in the same research project, in contrast to multimethod research which may only refer to the combination of two or more qualitative methods (i.e., participant observation and interviews). Triangulation usually concerns various aspects of research and implies the
Critical realism (CR), which is largely based on the writings of Bhaskar (1975, 1978, 1989) and others (Archer et al. 1998; Fleetwood 1999; Lawson 1997; Sayer 1992), is often seen as a middle way between empiricism/positivism on the one hand, and anti-naturalism/interpretivism on the other, thus introducing a more nuanced version of realist ontology. As such, CR embraces various methodological approaches from different philosophical positions by taking “a critical stance towards the necessity and validity of current social arrangements” without following “the extant paradigms’ assumptions at face value” (Mingers 2001, p. 248). This makes it particularly attractive for the study of IS, which is primarily a practice-based research domain encompassing aspects of both natural science and social science (Carlsson 2003, 2005; Dobson 2001; Mingers 2004; Venkatesh et al. 2013).

Recent work has developed a set of methodological principles for conducting CR-based case study research in IS (Wynn and Williams 2012) and highlighted the value of CR as an underlying theoretical framework for mixed methods (Mingers 2004; Venkatesh et al. 2013). Also of note is a small body of work that directly employs the distinctly CR (but rarely used) mode of analysis called retroduction (Strong and Volkoff 2010; Volkoff et al. 2007). However, the latter rests on qualitative case studies and therefore the implications of a retroductive CR methodology that introduces a thorough mixed-methods approach have been largely unexplored empirically (Mingers 2003).

Our purpose is to critically review how the methodological inheritance of IS tends to reinforce traditional dichotomies between qualitative and quantitative methods, thereby inadvertently reinforcing conventional and linear approaches to research (Creswell 2003; Law and Urry 2004; Tashakkori and Teddlie 1998; Teddlie and Tashakkori 2003, 2009). In contrast, through our particular reading and use of the ontological and epistemological principles of CR, we emphasize a more responsive and dynamic mode of inquiry called for in previous literature (Landry and Banville 1992; Morse et al. 2002; Myers 1997; Nandhakumar and Jones 1994; Walsham 1995a). The paper is structured as follows: We start by reviewing the distinctive conceptualization of causality enabled by the ontological assumptions of CR and explain how this affects the key epistemological principles of validity and generalization. We then describe the role of mixed methods research from a CR standpoint and explore the process of retroduction as the core methodological principle of critical realism. In the next section, we demonstrate the value of our approach to mixed methods CR research by drawing on a study of the impact of ICT, specifically SWIFT, adoption on bank performance. We conclude by discussing methodological implications of CR for mixed methods research in IS.

Methodological Implications of Critical Realism

It is argued that critical realism can add to IS research by opening up a particular methodological space that lies between empiricism and interpretivism (Mingers 2004). While the differences between philosophical paradigms and the way CR confronts empiricism and interpretivism is an interesting subject in itself, the aim of this paper is not to provide an exhaustive account of CR but rather to highlight some of its key methodological implications. For critical realism, the link between the assumptions about the existence of the world and society (ontology), the idea of how knowledge is possible and of what (epistemology), and the choice of methodological approach is of major importance. Following this premise, we start by exploring the ontological basis of CR that will help us make the ontology–methodology link. By taking this into account, we then discuss what is the CR view of causality and what is the role of validity within that.

Ontology, Generative Mechanisms, and Causality

Being a realist philosophy, critical realism maintains a strong emphasis on ontology and supports the idea of a reality (intransitive domain) which exists independently of our knowledge or perception of it (Archer et al. 1998; Bhaskar 1975, 1978, 1989). In contrast, the generation of knowledge is a human activity and depends upon the specific details and processes of its production (transitive domain) which can be established facts, theories, models, methods, and techniques of study that are used by researchers at a certain time and place. Hence, new knowledge is articulated in two dimensions: “it is a socially produced knowledge of a natural ([hu]man-independent) thing” (Archer et al. 1998, p. 65). This useful analytical distinction indicates that, despite its

combination of different insights in an investigation (e.g., data triangulation, investigator triangulation, theoretical triangulation, etc.; see Downward and Mearman 2006).
ontological realism, CR allows for a degree of epistemological relativism where the process of scientific knowledge is viewed as historically emergent, political, and imperfect (Smith 2006). Even though these limitations signify the fallibility or relativity of our knowledge (at least to some degree), it doesn’t necessarily mean that all knowledge is equally fallible. CR consents that some researchers may have more valid explanations or theories that approximate the intransitive domain with more probabilistic accuracy than others.

Besides the distinction between the transitive and intransitive dimensions of knowledge, critical realism assumes a stratified ontology divided into three domains: the real, the actual, and the empirical (Bhaskar 1975, 1978, 1989). This important illustration helps us understand that even though there is one reality it does not follow that we, as researchers, have immediate access to it or that we are able to observe and realize its every aspect. The domain of the real includes objects and structures with inherent causal powers and liabilities which result in mechanisms that may not be visible. According to Lawson (1997, p. 21),

A mechanism is basically the way of acting or working of a structured thing. Structured things [physical objects or social processes] possess causal [or emergent] powers which, when triggered or released, act as generative mechanisms to determine the actual phenomena of the world.

While generative mechanisms are not necessarily constantly empirically observable, their potentialities may still exist whether they are exercised or unexercised (Bhaskar 1978, 1998). Consequently, the actual is a subset of the real and includes the events generated from both exercised and unexercised mechanisms. Finally, the empirical refers only to the subclass of observable, experienced events and change (i.e., bears witness to the powers and liabilities characterizing structures that constitute generative mechanisms which in turn cause the experienced events). Figure 1 presents an outline of the three ontological domains.

The assumption of a deeper level where the structures and powers of things may or may not be observable is not only a point of theoretical distinction but also has important methodological implications. The main objective when pursuing CR-led research should be to “use perceptions of empirical events [those that can be observed or experienced] to identify the mechanisms that give rise to those events” (Volkoff et al. 2007, p. 835). As a result, the critical realist view on causality should not be about a relationship among distinct events (e.g., the fact that event “A” by and large has been followed by event “B”) but about realizing the process and conditions under which “A” causes “B,” if at all. While generative mechanisms form a key interest (Collier 1994), it is important to appreciate that “when…one writes that a mechanism has a tendency to x, one is, in reality, referring to the ensemble of structures, powers and relations: it is, strictly speaking, the ensemble that has a tendency to x” (Fleetwood 2001, p. 211). Accordingly, the existence of social laws assumes an assertion about the activity of some mechanism and not about the conditions under which the mechanism operates; hence, it is difficult to make statements about the results of its activity (Bhaskar 1975). This is because CR adopts a view of reality as an open and complex system where other mechanisms and conditions also exist. As a result, apart from the ensemble of structures, powers, and liabilities we should be attempting to identify the conditions in which generative mechanisms are experienced. This presents challenges not only in terms of our analysis of causation but also revises our methodological requirements and expectations for validity and generalization in research.

From a constructivist point of view, CR finds some common ground with interpretivism in that social phenomena are concept-dependent and need interpretive understanding (Giddens 1979). However, unlike interpretivism, CR does not exclude the existence of a relational intransitive domain in social structures. This idea is based on the notion of human attributes and social activities (e.g., physical features, or a structured activity like speaking a language) that result in causally effective social structures (Mingers 2004; Sayer 2000). Consistent with this line of “horizontal stratification” (Strong and Volkoff 2010), critical realists oppose interpretivists who do not succeed in relating discourses to these under-

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According to critical realists, these emergent powers or liabilities cannot be reduced further to those of their constituents. For example, we cannot disaggregate the power of people to think by reference “to the cells that constitute them, as if the cells possessed this power too” or the power of water to that of its constituents (oxygen and hydrogen) as these belong to a different stratum (Sayer 1992, pp. 118-119). For a further discussion on this stratification and the distinction between internal and external relations see Chapter 4 in Sayer (1992).
lying social structures which influence the behavior of agents or groups in which agents are embedded (Granovetter 1985).

In practical terms, the CR position on causality means that a different mode of inference needs to be adopted in order to explain events “by postulating (and identifying) mechanisms [liabilities and powers] which are capable of producing them” (Sayer 1992, p. 107). This logic of inference, which could be better described as “thought operation” (Danermark et al. 2002), is called *retroduction* (Bhaskar 1975). Retroduction allows researchers to move between the knowledge of empirical phenomena as expressed through events to the creation of explanations (or hypothesizing) in ways that hold “ontological depth” and can potentially give some indications on the existence of unobservable entities (Downward and Mearman 2006). This makes it possible to understand how things would have been different, for example, if those mechanisms did not interact the way they did. Under these circumstances, patterns of empirical events can provide inadequate information about the activity of the mechanisms in play.

It has been widely argued that this retroductive approach to research embraces a wide variety of methods (Downward and Mearman 2006; McEvoy and Richards 2006; Mingers 2000, 2001, 2003, 2004, 2005; Mingers and Gill 1997; Venkatesh et al. 2013; Wynn and Williams 2012) where qualitative and quantitative approaches can be integrated in order to hypothesize and identify the generative mechanisms that cause the events we experience. However, regardless of whichever method is used, there is a common principle, namely that “the foundation for our knowledge [produced in the transitive domain] is the empirical domain” (Danermark et al. 2002, p. 155). Figure 2 illustrates the process of knowledge creation in CR and the place of retroduction within that (loosely adapted from Downward and Mearman 2006). The value of retroduction in combining different methods will be further elaborated later.

**Validity and Quality of Inferences**

Having briefly described causal mechanisms and reviewed the retroductive approach to knowledge creation, we now explore the implications of using retroduction for the validity and the quality of inferences produced. Specifically, we need to examine how the conventional concepts of validity described in the mixed-methods literature (Creswell and Clark 2007; Lee and Hubona 2009; Maxwell 1992; Ridenour and Newman 2008; Tashakkori and Teddlie 1998; Venkatesh et al. 2013) change in the face of critical realism. Validity often signifies the level of quality and rigor of research and can have a significant impact on the quality of inferences that are generated from a study. In order to avoid any confusion due to the variability between connotations of the terms used for validity in different textbooks and papers (Lincoln and Guba 1985, 2000; Morse et al. 2002), we follow the classification proposed in Venkatesh et al. (2013) and Teddlie and Tashakkori (2003, 2009). The use of that terminology contributes to our discussion later on when we talk about validation within MM IS research.

By synthesizing the literature on different validity types, Venkatesh et al. generally outline three distinctive categories for validity which are widely used and are somewhat common...
for quantitative and qualitative research. These are design validity, measurement (or analytical) validity, and inferential validity. In quantitative research, design validity broadly refers to internal (that the correlation observed is causation) and external (results can be generalized) validity. Measurement validity includes the reliability of the data (i.e., if there is measurement error) and construct validity that describes the degree to which the variables used in the model capture what they intend to measure. Finally, inferential validity refers to the validity of the statistical conclusions and whether they are sufficient in order to make inferences.

In qualitative research, despite the different points of view on the need for validity (Denzin and Lincoln 1994; Guba and Lincoln 2005), there is agreement that validation is crucial to the development of a common scientific body of knowledge (Maxwell 1992; Morse et.al. 2002; Venkatesh et al. 2013). Hence, scholars have established similar terms and definitions for validity focusing on how well the qualitative study was designed and executed (design validity); how well data were collected and analyzed, in order to get dependable, consistent, and plausible findings (analytical validity); and, finally, how to assess the overall quality of interpretation and inferences (inferential validity). The first two columns in Tables 1 and 2, which are loosely adapted from Venkatesh et al. and from Johnston and Smith (2010), provide a summary of the types of validity in qualitative and quantitative research.

We can now compare some of these conventional views of different types of validity with that of critical realism. As mentioned before, CR moves the center of attention from empirical events to underlying causal mechanisms by arguing that these could be independent and non-related. What this means in practical terms is that while an empiricist is concerned with whether correlated empirical phenomena are causally linked (internal validity), a critical realist will be looking to establish whether the generative mechanism hypothesized or uncovered is involved in the observed events in the field (Johnston and Smith 2010; Modell 2009; Wynn and Williams 2012). Similarly, for CR, external validity would be concerned with the generalizability of the knowledge claims about one or more causal mechanisms, that is, the belief that the generative mechanism or mechanisms that caused the observable events (in our specific research setting and under certain circumstances) also caused similar (or even different) outcomes in other domains. Finally, construct validity would address whether “empirical traces give information about the actual events…that are purportedly caused by the generative mechanisms” (Johnston and Smith 2010, p. 33). The difference of these three validity types between the conventional view (dashed lines) and the CR view (continuous lines) is illustrated in Figure 3 (loosely adapted from Johnston and Smith 2010).

As can be seen in Figure 3, the conventional interpretation of construct validity focuses on the relationship between the theoretical concepts (construct 1 or 2) and their operational definitions (observed variables) existing in the empirical domain (measurement 1 or 2). In contrast, according to CR, construct validity should be concerned with the correspon-
### Table 1. Validity in Quantitative Research

<table>
<thead>
<tr>
<th>Validity Type</th>
<th>Conventional Description</th>
<th>Critical Realism</th>
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</thead>
<tbody>
<tr>
<td>Design Validity</td>
<td><strong>Internal validity:</strong> The observed correlation between variables of interest in a causal effect.</td>
<td>Actual events are manifestations of the particular generative mechanism in the context of the field.</td>
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<td></td>
<td><strong>External validity:</strong> The cause–effect relationship goes beyond the variation of samples, settings, and treatment variables, thus results can be generalized.</td>
<td>The likelihood that similar or related events that occur (or might occur) in other settings are caused by the generative mechanism that caused the actual events in the field.</td>
</tr>
<tr>
<td>Measurement Validity</td>
<td><strong>Reliability:</strong> The variables used in the model do not have measurement error.</td>
<td>The measurements used in the extensive methods do not have measurement error.</td>
</tr>
<tr>
<td></td>
<td><strong>Construct validity:</strong> The variables indicate what they are intended to measure (consistent with the theoretical description).</td>
<td>Whether data that is empirically available gives valid knowledge about the actual manifestation of the alleged generative mechanism in the field.</td>
</tr>
<tr>
<td>Inferential Validity</td>
<td><strong>Statistical conclusion validity:</strong> Statistics are appropriate and findings from the statistical analysis are adequate to construct a narrative.</td>
<td>Findings from statistics can provide information about the relationships of events observed in the empirical domain (not causal assumptions).</td>
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### Table 2. Validity in Qualitative Research

<table>
<thead>
<tr>
<th>Validity Type</th>
<th>Conventional Description</th>
<th>Critical Realism</th>
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</thead>
<tbody>
<tr>
<td>Design Validity</td>
<td><strong>Descriptive validity:</strong> Accuracy of events, objects, behaviors, and settings reported.</td>
<td>Explanations of mechanisms in action and the conditions with which they are interacting; appreciation of the field by identifying, prioritizing, and scoping boundaries of the study.</td>
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<td></td>
<td><strong>Credibility:</strong> Results are believable from the participants of the research.</td>
<td>The idea that similar or related events that occur (or might occur) in other settings are caused by the generative mechanism that caused the actual events in the field.</td>
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<td></td>
<td><strong>Transferability:</strong> Results can be generalized and transferred to other settings.</td>
<td>The idea that similar or related events that occur (or might occur) in other settings are caused by the generative mechanism that caused the actual events in the field.</td>
</tr>
<tr>
<td>Analytical Validity</td>
<td><strong>Theoretical validity:</strong> Theoretical explanation developed fits the data.</td>
<td>Theory is used to help hypothesize about the mechanisms and provide explanations for the events that have occurred.</td>
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<td></td>
<td><strong>Dependability:</strong> Researchers describe changes in the research setting and its effects on the research approach of the study.</td>
<td>This is an essential part of the retroductive process and identification of contingent factors.</td>
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<tr>
<td></td>
<td><strong>Consistency:</strong> Verifying the steps of qualitative research process.</td>
<td>Challenge and inform the terms of (quasi-)closure and process of ongoing inquiry in retroductive analysis.</td>
</tr>
<tr>
<td></td>
<td><strong>Plausibility:</strong> Findings of the study fit the data from which they are derived.</td>
<td>Whether data that is empirically available gives valid knowledge about the actual manifestation of the alleged generative mechanism in the field.</td>
</tr>
<tr>
<td>Inferential Validity</td>
<td><strong>Interpretive validity:</strong> Interpretation of participants’ views are accurate.</td>
<td>Findings from qualitative research can provide information about the mechanisms that cause the events at the empirical level.</td>
</tr>
<tr>
<td></td>
<td><strong>Confirmability:</strong> The results are confirmed by others.</td>
<td>Findings from qualitative research can provide information about the mechanisms that cause the events at the empirical level.</td>
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</table>

dence between empirical traces of events (E₁ and E₂) and the information they give us about the actual events in the field we are studying (C₁ and C₂), which in turn are manifestations of the mechanisms we seek to uncover. In parallel, internal validity in Figure 3 demonstrates the different notions of causation, which on the one hand is perceived as the correlation between empirical observations (measurement 1 and 2), and on the other hand focuses on the generative mechanisms in the domain of the real that cause the actual events we experience in the empirical domain.

Finally, external validity, which represents the attempt to generalize in the empirical domain by inferring that the presumed causal relationship between two observable events...
(e.g., measurement 1 and 2) potentially applies across different contexts (persons, organizations, locations, and times) and alternative measures, is highly problematic from the perspective of CR (Johnston and Smith 2010; Tsoukas 1989). This is because it combines and confuses the empirical traces with the actual events that are produced through on-going interaction of mechanisms. Since empirical events are particular manifestations of the mechanisms that caused them, it cannot be assumed that because a relationship between events appears under one set of circumstances it will appear again in exactly the same form in a different context, thus, causal laws should be ontologically distinct from patterns of events (Tsoukas 1989). The same relationship may appear but not involve exactly the same mechanisms, or may not appear, but this does not imply that the specific mechanisms were absent because they might have been counterbalanced by the presence of other mechanisms. Instead, according to CR, generalizations are valid when we are confident that similar or other events that arise (or may arise) in other contexts are caused by the same generative mechanisms that led to the actual events in our research domain.

The emphasis on studying multiple, dynamic, and shifting relationships in context would seem to favor qualitative approaches capable of producing situated analytical explanations that might help reveal the potential mechanisms involved in observable events. In the interpretive school of IS research, generalizing from a single case study is a commonly accepted practice (Lee and Baskerville 2003; Markus et al. 2006; Walsham 1995b). Researchers leverage existing statements of causal mechanisms to explain events in different settings and hence refine their theories by validating “the explications of causal tendencies and the interplay of mechanisms and context” (Wynn and Williams 2012, p. 805). Hence, the degree of external validity is subject to discerning between the contingent factors from the necessary ones (Sayer 1992). This is to say that it is not logical to talk about the impact of IT, for example, when it is not possible to separate the external or contextual conditions within the organization that partially influence the effects we see, from the internal (necessary) properties of the technology we study (Smith 2006). This well-reasoned and systematic conceptual abstraction of the object characteristics from external conditions is an essential part of theorizing which leads to our knowledge of things5 (Danermark et al. 2002) and needs to be

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5This position of external realism is based on the ontology of CR and is what differentiates it from interpretivism whose lack of an external reality and acceptance of subjectivity does not allow us to discern between competing theories and thus generalize (Walsham 1993). The CR process of theorizing entails the continuous restructuring and adjustment of abstractions that determine the nature of the research object (Danermark et al. 2002).
combined with a description of the empirically researched contingencies, within which causal powers have taken place (Tsoukas 1989).

Accepting a critical theorist view of generalization changes the role of quantitative approaches which usually measure events in order to theorize social laws based on the regularity and degree of correlation between variables (Lawson 1994). However, from a CR perspective, even though structures are comprised by situated interactions which are better understood qualitatively, it is also likely to be useful to employ quantitative measures to quantify certain characteristics of a structure or object. In that respect, statistical descriptions are regarded as helpful simplifications, which serve as “a quantitative measure of the numbers of objects belonging to some class or a statement about certain common properties of objects” (Sayer 1992, p. 100). For example, one might say that 80 percent of organizations with high diversity are multinationals or that larger firms tend to invest more in technology. The important characteristic of these overviews is that, even though they suggest a necessary relationship or correlation, they do not say anything about the causal status of the relationships (if any) and, thus, should be seen as descriptive summaries rather than predictive tools (Fleetwood 1999; Lawson 1997; Sayer 1992).

In the next section, we will describe in more detail the role of different methods in CR including that of quantitative techniques and the extent that they can be used to shape our knowledge about the world. More importantly, we will discuss how qualitative and quantitative techniques can not only complement each other but be reciprocally responsive in a MM research design and produce robust meta-inferences that would be difficult to produce using single methods.

**Mixed-Methods and the Process of Retroduction**

**The Role of Quantitative Methods**

The role of quantitative or extensive methods within CR is largely viewed as descriptive, since quantitative summaries and correlations between variables alone cannot uncover evidence on the causal mechanisms that generate the actual events we observe or predict future incidents. On that basis, a lot of the empirical work in IS journals that uses quantitative methods to generalize knowledge claims has been described as unsatisfactory and problematic (Seddon and Scheepers 2012), underlying further the need to reevaluate the role of extensive methods within not only IS, but social sciences as a whole. Most of the CR critique on quantitative methods is directed toward the field of economics and the use of econometrics (Bache 2003; Cartwright 1989; Downward and Mearman 2002; Fleetwood 1999; Hands 1999; Hoover 1997; Lawson 1994, 1997). Econometric modeling is based on the development of statistical methods (most often regression analysis) for testing economic theories, estimating relationships that emerge from patterns identified in the data, and forecasting economic situations (Wooldridge 2006). In IS, econometrics is often used to identify relationships and patterns that surface from the use of technology in organizations and to estimate the impact of innovation adoption from individuals. As such, it has achieved considerable prominence among IS researchers, policy makers, and senior managers (Aral et al. 2006; Brynjolfsson and Hitt 1995, 1996; Draca et al. 2007).

Focusing exclusively on the identification of strictly defined patterns of observable events (regularities) in order to make causal statements in support of the argument that correlation is causation would indeed be at odds with the stratified ontology of CR. For example, by suggesting that a correlation between the use of IT by policemen and an increase in crime rates means that IT causes more crime may be an inappropriate leap of causation when in fact IT has simply improved the recording of crime levels. Nevertheless, it is reasonable to argue that we can escape this deductive logic used in mainstream economics, which, according to CR, often leads to epistemic fallacy (Lawson 1997), and use statistics in line with CR ontological assumptions. The extent to which econometrics or other statistical techniques can be helpful within CR research relates to “the role played by demi-regularities” (Bache 2003, p. 14). Demi-regularities can be understood as the partial event regularities that indicate “the occasional, but less than universal, actualization of a mechanism or tendency, over a definite region of time-space” (Lawson 1997, p. 204). For example, when exploring the impact of social media on company reputation and revenue, a large number of mechanisms can influence the wide range of results that have been identified by scholars. However, when the research is restricted to the impact of a particular social media travel web-site, on five-star hotels, in a specific region, between 2000 and 2002, then it begins to become possible to focus selectively on the particular mechanisms involved in this relationship. In such contexts, the role of a demi-regularity is twofold: first, it can play a significant part in focusing the research design and developing propositions about existing causal mechanisms, and, secondly, it can help to assess and explain the results in the analysis phase. It achieves this by focusing us on indicative patterns in the data which are thus raised up for further inquiry of a qualitative and comparative kind. It can also inform research design by confirming or challenging the boundaries of inquiry.
As mentioned, CR fundamentally accepts that social scientists deal with complex and open social systems where causal mechanisms are subject to external conditions (including other mechanisms) depending on the context, and that the objects of research are also likely to change. This means that the boundaries of the inquiry may have to be revised as the research process advances which may help define them. Consequently, many critical realists argue that demi-regularities are rarely to be found in the social realm and can only exist when specific mechanisms come to dominate within restricted contexts. In other words, when we scope our studies and limit the conditions of possibility by establishing extrinsic conditions of closure that serve as analytical boundaries (e.g., focusing on a particular sector, historical period, or geographical region) while simultaneously setting up intrinsic conditions for closure in the object under study (e.g., an organization or a specific technology) in an effort to ensure that it does not undergo any qualitative variation (e.g., culture or technological change). However, characterizing a social system as closed is problematic from a critical realist perspective which is founded on the premise of interacting open systems (Bhaskar 1975). But what does this imply for research methods that, in their conventional use, depend on conditions of closure?

Sayer (1992) maintains that while most social systems we encounter violate these conditions of extrinsic and intrinsic closure, partially closed systems that enjoy quasi-closure can be studied separately if we restrict our research spatially and temporally based on the specific contextual factors that affect our conditions. Hence, it is up to the social scientist to construct the conditions of closure in order to get closer to the real mechanisms that cause the events in the domain of the actual (Tsoukas 1989). In this case, demi-regularities can play a significant role as we are going to illustrate later through our example. Consequently, the degrees of closure and the specific nature of quasi-closure are important to epistemological (if not ontological) claims (Downward and Mearman 2006).

Revising the scope of a study does not have to be a singular act but may form part of the process of analysis as each revision to the boundaries of quasi-closure may enable the particular use of research methods to recover different information about specific mechanisms (Cartwright 1989; Fleetwood 1999; Lawson 1994, 1997). Although demi-regularities are a point of debate among critical realists, the argument that they might reveal patterns in conditions of quasi-closure would make the contribution of quantitative methods much more significant than previously assumed by Bhaskar, Fleetwood, and Lawson (see Bache 2003; Downward and Mearman 2002; Hands 1999; Hoover 1997). Whatever the case, we believe that the legitimacy of quantitative methods within critical realism lies more with the interpretation of statistics and the process of revising the parameters of our models to achieve appropriate degrees of closure (boundaries) in our research design than any inherent quality of the methods themselves. Henceforth we argue that by focusing on these two important aspects of extensive methods, namely demi-regularities and degrees of closure (quasi-closure), we can demonstrate the value of their role at various stages of the retroductive methodology proposed by CR (Mingers 2000, 2005).

The Role of Qualitative Methods

In contrast to quantitative methods, the role of qualitative or intensive methods within CR is more profound. This is because intensive methods (e.g., interviews, ethnography, case studies, historical narratives, etc.) are "epistemologically valid" (Tsoukas 1989, p. 556) and more capable of describing a phenomenon, constructing propositions (or hypothesizing), and identifying structures and interactions between complex mechanisms (Layder 1990; Sayer 2000; Volkoff et al. 2007). We should also remind ourselves that social phenomena or structures are concept-dependent and thus are not independent from the agents’ notion of them or the apparatus through which they became observable. Consequently, the need for interpretation and understanding of their actions is quite significant. In addition, social structures are fundamentally subject to geographical and historical conditions (contingent status of social structures) as the social systems they belong to are inherently interactive and open (Mingers 2004). Therefore, it becomes easier to use a theory for explanatory or descriptive purposes than to test a theory using empirical effects. This is because theories help to conceptualize objects and structures “at the abstract level about necessary or internal relations” while they “remain agnostic about relations which are contingent” (external) that rely on empirical questions and on observing actual cases at the concrete level (Sayer 1992, p. 143).

Considering the importance of the existence of contextual factors (external and contingent circumstances that are both space and time dependent) in knowledge generation and generalization within CR, the role of the empirical qualitative

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6 This idea that social laws might exist within limited domains is also referred to as local realism (Cartwright 1989). In spite of that, some critical realists argue that even when these demi-regularities exist, they would still be inadequate to meet the requirements of econometric analysis and hence cannot be recovered with conventional quantitative methods (Lawson 1997; Mingers 2005).

7 Here we use the idiom retroductive methodology to refer to the methodology that is driven by the retroductive approach described previously.
methods is to uncover these conditions and distinguish them from the *necessary* (internal) aspects of objects and structures. In that respect, historical narratives, archival research, and semi-structured interviews can play a significant part in building informative narratives. Figure 4 illustrates the different types of methods that can be used in a retroductive methodology and their potential to be synthesized (extensive, intensive, and abstract).

**Designing Mixed-Methods Research**

From the discussion above, it should be apparent that CR does not commit to a single type of research but rather endorses a variety of quantitative and qualitative research methods. This *critical methodological pluralism* is not taken lightly but is grounded in the ontological and epistemological assumptions of CR, thus preserving a strong link between meta-theory and method (Danermark et al. 2002). As described earlier, a major premise that leads to this kind of multiplicity is that social phenomena are contextually defined (i.e., they are subject to other mechanisms and causal powers in the system) and furthermore that mechanisms cannot always manifest themselves empirically since they can be suppressed in a complex interaction. So the choice of methodology then depends on the capability and complementarity of different methods to convey different kinds of knowledge about generative mechanisms.

The value and purpose of MM research in social science and in IS particularly has been discussed extensively elsewhere (Teddlie and Tashakkori 2003, 2009; Venkatesh et al. 2013); however, their role within CR is quite different. For example, the main purpose of quantitative methods in conventional IS research is theory testing and so they are often used in confirmatory studies. Critical realists object to that view because, as we have seen, statistical generalizations at the empirical level (described as conjunctions of events) cannot make meaningful connections with and validate the qualitative results (see “corroboration/confirmation” in Table 3) whose purpose is to identify active mechanisms (Downward and Mearman 2006). For the same reason, the use of qualitative work as preparation for quantitative work would also not be consistent with the CR approach unless the latter is followed, again, by further qualitative work in a way that informs the retroductive process.

Generally speaking, the most profound and widely recognized approach to mixed methods, in line with CR’s retroductive methodology, is to use extensive methods to identify and establish demi-regularities with data patterns, which are then used to guide intensive research that will uncover the mechanisms, agencies, and social structures that produce the behavior observed (see “complementarity” in Table 3). However, further ways of combining MM research can be identified. For example, MM design can be used to ensure that a
Table 3. Purposes of Mixing Methods in Critical Realism

<table>
<thead>
<tr>
<th>Purpose of Combination</th>
<th>Description</th>
<th>Implication from CR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complementarity</td>
<td>MMs are used in order to gain complementary views about the same phenomena or events</td>
<td>Different levels of abstraction of a multi-layered world demand different methods</td>
</tr>
<tr>
<td>Completeness</td>
<td>MM research design is used to ensure a complete picture (as detailed as possible) of the phenomenon under study</td>
<td>Requires meta-theoretical considerations (i.e., angle of approach)</td>
</tr>
<tr>
<td>Developmental</td>
<td>Inferences of one type of research are being used as questions for another type of research</td>
<td>This being part of the retroductive approach of CR, inferences need to hypothesize about the causal mechanisms whose recovery will then inspire additional research</td>
</tr>
<tr>
<td>Expansion</td>
<td>MMs are being implemented in order to provide explanations or expand the understanding obtained in previous research</td>
<td>Quantitative methods can be used to guide qualitative research which (subject to the context) is more capable of uncovering generative mechanisms</td>
</tr>
<tr>
<td>Corroboration/Confirmation</td>
<td>MMs are used in order to confirm the findings from another study</td>
<td>Epistemic fallacy occurs when trying to validate qualitative results with quantitative methods</td>
</tr>
<tr>
<td>Compensation</td>
<td>The weakness of one method can be compensated by the use of another</td>
<td>The weaknesses of different methods are recognized so alternative methods can be used to compensate</td>
</tr>
<tr>
<td>Diversity</td>
<td>MMs are used in order to obtain divergent views on the same phenomena</td>
<td>Different levels of abstraction of a multi-layered world demand different methods</td>
</tr>
</tbody>
</table>

systematic picture of a phenomenon is obtained (see “completeness” and “diversity” in Table 3). This is particularly feasible when a specific object has quantifiable properties or we want to measure the number of objects that belong to a class while at the same time we are trying to improve our qualitative understanding. In such cases, though, it is important to consider the angle of approach and the level of abstraction beforehand. Another case could be that of “compensation” (see Table 3), where the limitations of one method can be compensated by the use of another, or that of “developmental” and “expansion,” where previous research raises new questions that demand further explanations in terms of generative mechanisms. While prior literature has generally acknowledged that the use of different methods may overlap (see Downward and Mearman 2006; Venkatesh et al. 2013), we provide a more detailed account of their interplay in CR and the value that this adds to validity, the development of meta-inferences and generalization of research (see Table 3).

Following the previous discussion, CR accepts that different research methods have complementary strengths and limitations, and that in general, the insights from extensive methods need to be moderated (Sayer 2000). For this reason, it has been argued that “the validity of the qualitative analysis of cases [should] not rely upon broad quantitative evidence” (Downward and Mearman 2006, p. 89). Even though this characterization seems to suggest that different methods are ultimately focusing on different ontological paradigms (i.e., supporting conventional dichotomies between quantitative and qualitative research), this is not the intent. Rather, methods are seen to be redescriptive devices uncovering alternative views of objects of analysis in order to compare their relative standing (and therefore the validity of the findings produced) as well as allowing them to mutually inform each other. Consequently, the appropriateness of methods will be ultimately determined by the research questions under consideration and the nature of object (e.g., the level of abstraction, emphasis, and measurement scales), as well as the degree of closure that is assumed8 (Downward and Mearman 2006). For example, while a study can address more than one research question, all of the questions might focus on the same phenomenon for which they will stress

8In this regard, it could be argued that qualitative methods are more powerful because they might involve less closure than quantitative methods. Having said that, qualitative methods (e.g., interview data) also require some level of closure and coding of responses that will ultimately have an effect on the capability to mirror the direction and magnitude of variation in responses, and, thus, affect the inferences that can be made (Downward and Mearman 2006).
different aspects of abstraction and uncover alternative characteristics of the same layered reality. Holding that in mind, the logic of retrodaction not only suggests the recognition of MM research but at some level it implies its necessity as well as the need to articulate its deployment as a systematic process.

The Retroductive Process in CR

While most textbooks and papers on MM research propose various guidelines and research strategies based on the sequence and implementation of method (Creswell 2003; Tashakkori and Teddile 1998), the retroductive methodology focuses on research and intervention not as a discrete event but as a creative process with different phases that involve different types of activities (Bhaskar 1978; Mingars 2005). Its main objective is to link the structures and causal powers of the objects under study to the events we want to explain through the notion of causal mechanisms (Wynn and Williams 2012). In doing so, four main phases are identified.

The first phase involves the description or appreciation of the research situation and focuses on the identification of the composite events or phenomena under study. As it is not possible to examine all possible distinctive constituents of a study or phenomenon, a decision needs to be made about which components to select. The acknowledgment of situatedness plays a key role here and serves as an important resource (Runde and de Rond 2010). In working through the feasibility of a study, CR encourages the researcher to regard all data as situated in a point of view (i.e., focusing on one or another aspect of some event) which helps to devise the initial design and consider gaps in the corpus of data that needs to be collected in order for the research to be systematic. This pertains not only to the identification of data sources that will enable comparative analysis (e.g., interviews, quantitative data, historical documents, surveys, etc.), but also motivates deeper examination into the relative insights afforded by each data type and method of analysis. Finally, another central achievement of this stage is to consider extant theoretical schemes (in the academic literature and in the domain under study) and consider how these can help to shape the existing descriptions of the phenomena.

The second phase, that of the actual retroductive analysis of the data, involves hypothesizing about the possible mechanisms or structures capable of generating the phenomena that have been observed, measured, or experienced. An important part in this process involves abstracting and analyzing objects in terms of their constitutive structures and causal powers. This enables the identification of the conditions and properties necessary to generate the event under study. This may involve revising the boundaries or scope of focus in the study. During these iterative phases of analysis, we engage in a process of abstraction where propositions are developed for use in subsequent phases of investigation. We then consider the context of the study and investigate how these necessary powers and the liabilities recovered are at work in specific conditions in the concrete domain. The analytical dynamic at work in the process of abstraction is resonant of “constant comparison” in grounded theory (Strong and Volkoff 2010) in that it involves iterative cycles of reflection between academic literature (original theories), data, and propositions in an effort to achieve analytical stability about the mechanisms (activated or unactivated) characterizing an event or outcome.

Following that, the third phase focuses on the critical assessment and elimination of the alternative explanations that have been produced. When using MM research, this entails comparison between the findings or inferences produced by the combination of methods—or what Venkatesh et al. (2013) refer to as “meta-inferences.” It also involves the use of complementary theoretical interpretations and abstractions to explain how different mechanisms interact under certain conditions and how they contribute to concrete social phenomena.

Finally, action is required in order to circulate the research findings and, where applicable, see if the causal explanations uncovered so far are satisfactory to an “intended audience” with background knowledge and expertise (Runde 1998). In addition, action stage often involves the development of programs of change appropriate to the situation based on the responses. To sum up, the above phases generally address the following questions: “What is happening? Why is it happening? How could the explanation be different? And, so what?” (Mingers 2001, p. 246). This retroductive process, variations of which have been described elsewhere (Danemark et al. 2002), should not necessarily dominate the research design of a mixed-methods research but, rather, can be usefully drawn upon to implicitly guide activities as the study progresses.

An Example of Applying Critical Realism to IS Research: A Mixed-Methods Study on ICT Adoption and Firm Performance

In this section we provide an example of mixed-methods research in IS using critical realism as the underlying philosophy. We draw on the retroductive process discussed
in the previous section and demonstrate the methodological implications of CR in action. Using an in-depth field study conducted by two of the authors of this paper, we illustrate how MM research informed by a critical realist approach can reveal underlying mechanisms, validate findings, and generalize results in an interactive, responsive and often iterative process of inquiry. Our goal is to illustrate the value of MM research and how it can be guided by a CR perspective to uncover robust meta-inferences in IS (Venkatesh et al. 2013).

**The Effect of SWIFT Adoption on Bank Performance**

In this research we focus on one of the most hotly debated topics in IS research: the effect of ICT adoption on firm performance (Brynjolfsson 1993; Brynjolfsson and Hitt 1995, 1996, 1997; Dewan and Min 1997; Lichtenberg 1995; Triplett 1999). To address this matter, we conducted a longitudinal study to understand the impact of a specific financial telecommunications innovation (SWIFT) on the performance of banks. Founded in Brussels in 1973, the Society for Worldwide Interbank Financial Telecommunication (S.W.I.F.T.) is a cooperative, member-owned, international, organization serving as a shared global communications platform and a messaging standard for cross-border financial transactions. SWIFT was originally founded with the objective of automating and potentially replacing the Telex as a means of communication between banks (Scott and Zachariadis 2012). Consequently, the nature of SWIFT and the benefits that it offers are deeply rooted in the history of correspondent banking and the development of ICTs since the 1970s. Consistent with the critical realist approach, in order to study the effects of SWIFT adoption on bank performance, we designed a MM retroductive methodology with the purpose of identifying the mechanisms (liabilities and powers lying in the domain of the real) that are capable of producing the events we observe in the empirical domain (see Figure 5 for a summary).
Table 4. Main Steps During the Retroductive Process

<table>
<thead>
<tr>
<th>Method</th>
<th>Key Findings</th>
<th>Assessment &amp; Next Steps</th>
<th>Retroductive Emphasis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Exploratory interviews</td>
<td>“SWIFT is the plumbing of financial services,” hence effect on bank performance assumed</td>
<td>Helped identify the debate in the sector and guide the next steps of the research study; further the nature of SWIFT</td>
<td>Appreciation</td>
</tr>
<tr>
<td>2 Econometric modeling (generalization)</td>
<td>SWIFT adoption is correlated with bank performance; used the whole population of SWIFT and non-SWIFT adopters in 29 countries between 1977 and 2006</td>
<td>Identified a conflict between findings of exploratory interviews and QUANT analysis; specify SWIFT adoption; identify structure and necessary relations of SWIFT</td>
<td>Appreciation/ Retroductive Analysis</td>
</tr>
<tr>
<td>3 Interviews/Historical narrative on the role and benefits of big banks (abstract &amp; concrete research)</td>
<td>The impact of SWIFT is subject to historical developments in the banking sector and the different context of adoption; technological, business standards, and other factors affect the nature of SWIFT itself</td>
<td>Theorized on the structure of SWIFT (powers, capabilities, and liabilities—abstract level) and how these are affected by the external mechanisms in different context, whereby producing different results (concrete research); need to confine further QUANT analysis and take into account QUAL findings</td>
<td>Retroductive Analysis</td>
</tr>
<tr>
<td>4 Econometric modeling of small banks</td>
<td>SWIFT adoption is correlated with small bank performance (revenue increase); used a sample of small, retail banks that adopted SWIFT at a later stage (between 1998 and 2006)</td>
<td>Identified a demi-regularity that was in line with previous QUAL results; using previous findings restricted analysis to specific samples in order to create closure; investigate further small retail banks and explore value-generating mechanisms</td>
<td>Retroductive Analysis</td>
</tr>
<tr>
<td>5 Small bank case study (concrete research)</td>
<td>SWIFT creates value through giving access to new clients and products; helps increase revenues (and not decrease costs as first instance); economies of scale through automation and aligning standards</td>
<td>Identified a particular mechanism in action and how the specific context (that of a small retail bank that adopted SWIFT late) influenced realization of SWIFT capabilities and benefits; consider theories and eliminate competing explanations</td>
<td>Retroductive Analysis</td>
</tr>
</tbody>
</table>

**Appreciation Phase**

As outlined in the first two steps of the retroductive process in Table 4, the “appreciation” phase provided the basis for our first round of analytical boundary-making to scope the research. As discussed earlier, establishing the terms of quasi-closure offers an opportunity to focus and in so doing prompts us to examine the possibility for data collection and modes of analysis within these boundaries. Thus we set the boundaries of our study in recognition that SWIFT forms part of an identifiable sector offering a range of opportunities for access to statistical databases that enables the matching of firm data (accounts showing profit over time) and, as an industry cooperative, it has a defined membership (with records of adoption). When related to the skill sets and resources available in our research team, these characteristics inspired our choice of mixed-methods and provided a point for the process of retroductive analysis to begin.

As discussed in the section on designing MM research, in a CR approach qualitative methods are not used to establish an agenda that is then tested. Instead, these methods serve as a useful way to produce insights into new phenomena that will inform subsequent phases of the retroductive process, some of which may involve quantitative techniques. In our study of SWIFT, exploratory open interviews were used in the appreciation phase to identify the distinguishing features of its context and begin the process of revealing complex dynamics at work, as well as exploring the opportunities for data collection (see step 1 in Table 4).

The insights from exploratory interviews helped us get a sense of the issues that experts in the field regarded as important, thus confirming or revising the questions in our qualitative fieldwork protocol. We were struck by what seemed like a contradiction in terms: on the one hand, professionals in the financial sector asserted that SWIFT is merely the “plumbing” of the banking sector and thus they would “question the rise in profits [attributed] to SWIFT,” while on the other they drew our attention to an on-going controversy regarding terms of membership (who gets to be a member and what kind of control this gave them over the priority given to the SWIFT network and standards agenda). These situated accounts of SWIFT’s contribution to firm performance triggered further research in order to gather additional views and to investigate further opinions as well as motivating us to
reconsider the boundaries of research from situated narratives by individuals to statistical descriptions of the SWIFT population. Were there sector-wide relational dynamics at work that were not observable in the average functional role? We set about examining what the interplay between intensive and extensive research methods would show (see step 2 in Table 4).

In parallel to the initial interview process, we had been exploring various possibilities for using the quantitative data sets that were available (e.g., SWIFT adoption data and firm level data detailing bank revenues, expenses, size, etc.). We decided to engage in extensive research methods using formal or established statistical descriptions in an effort to produce information about the relationship between measures of SWIFT adoption and that of bank performance (profit margin). In so doing, we revised the scope of our study from a relatively small number of personal narratives to statistics on the entire SWIFT membership. The quantitative exercise we performed included a panel dataset of 6,848 adopter and non-adopter banks from 29 (mostly OECD) countries and covered 10 years of financial performance data and 30 years of SWIFT adoption data. To identify the relationship of interest, we used a linear model of the form \( \Pi_{it} = \alpha + \beta_{\text{SWIFT}} + \gamma_{i} + \varepsilon_{it} \) and performed a statistical analysis using panel data econometrics.

The main finding from our analysis was that SWIFT adoption was indeed correlated with significantly higher bank performance (using different performance measures like ROS, ROA, and ROE and getting statistically significant results). This effect was persistent among different countries and regions and robust to different forms of estimation such as fixed-effects and first differences. In our case, sample selection was not an issue because we used the whole population of SWIFT adopters and matched it to a rich database that included nearly every bank worldwide. We also tried different techniques to exclude the possibility of reverse causality (the notion that more profitable banks would adopt SWIFT anyway, so the direction of any hypothetical causal effect would be the opposite). This mode of analysis showed that our variable of SWIFT adoption did not correlate with any measures of performance prior to SWIFT adoption. Also, by constructing lags, we were able to uncover patterns of performance drop in the first two years following SWIFT adoption by banks and subsequent increase in profit margins leading to a significant effect that lasted up to an average of 10 years.\(^9\)

Holding both qualitative and quantitative data in mind, we attempted to develop our appreciation of the issues raised into propositions that would inspire the next phase of analysis. This involved relating the preliminary analysis from our feasibility study to theories in this topic area: the capability of ICT to boost firm performance (also known as the productivity paradox debate\(^{10}\)); organizational capital and IT complementarities; the commoditization of technology; and network externalities. This cycle of reflection with the literature informed our hypothesizing about the adoption of SWIFT on firm performance. As a result, we set the received practitioner wisdom that “SWIFT is the plumbing of financial services” alongside a competing theoretically driven proposition that “SWIFT’s impact on firm performance has been overlooked.”

### Retroductive Analysis

As highlighted in step 3 of Table 4, an important element of the retroductive process is to abstract and analyze objects in terms of their constitutive structures and causal powers. In the next phase of the study, we drew up a fieldwork design involving further interviews and analysis of historical archive data with the aim of identifying the structures characterizing SWIFT (our object of research) in terms of its powers and liabilities in order to further understand the different views about its impact on firm performance.

We began by identifying the powers characterizing the deep structuring of SWIFT. Archive documents revealed that the founders of SWIFT represented the most significant large banks in the sector and their financial accounts showed that they provided a stable source of funding during its development. A combination of qualitative interview data, annual reports, and conference proceedings (video and text) revealed that the founding of SWIFT centered on a single mission (to replace Telex) so that prominent correspondent banks in the 1970s could reduce costs by automating (error prone) manual transaction processing. As a result of this highly focused strategy, SWIFT’s resources and organizational agenda were systematically organized around its realization. Technical specifications showed that the technology used at its founding was not state-of-the-art but rather provided a tried-and-tested infrastructure which meant that their goal of exceeding expectations in terms of reliability and security was soon achieved.

\(^9\)For more detail on the statistical data and econometric analysis see Scott et al. (2010).

\(^{10}\)While the productivity paradox is considered resolved by many contemporary scholars, the mechanisms and conditions under which ICT can be beneficial (or not) are still questioned (Brynjolfsson 1993). Hence, there seems to be a shift in the literature from the if to the how, making our MM retroductive approach more attractive.
which encouraged others to join. There were, however, significant liabilities during its development, including on-going concerns about whether a critical mass would join the network; the cost of integrating SWIFT with existing systems; dependence on telecom infrastructure dominated by post office monopolies in Europe; the absence of multi-jurisdiction regulation to govern cross-border transactions; and the fact that the organization and priority of SWIFT were subject to the interests of its founders as expressed through the board of directors and its terms of governance. The significant body of data gathered on this last point was summed up in the words of various interviewees as follows: “SWIFT was built by big banks, for big banks,” “Don’t forget your mother,” “Don’t do a VISA” (i.e., be a private company rather than a cooperative).

As our analysis became more refined, we began to appreciate that these powers and liabilities were exercised to varying degrees at different points in the historical evolution of SWIFT’s organization and network (Scott and Zachariadis 2012). At the time of the founding of SWIFT (1970s), the company’s strategy was centered on “twenty banks getting rid of their problems.” As one of our interviewees pointed out, “We had about 60 to 70 people to process [600 to 700 trades per day], now they do most likely 10,000 to 15,000 and have about 30 people.” Gaining a historical perspective drew our attention to two important points: first, it became apparent that the costs and benefits incurred by founder banks were different from those experienced by late adopters; and second, that these late adopters were often much smaller banks compared to SWIFT’s founders (the big banks). Figure 6 depicts the (causal) powers and liabilities underlying the mechanisms in action for large banks, which have been highlighted in step 3 of the retroductive process shown in Table 4.

With further interviews and archival work, we were able to uncover evidence that showed significant changes in the terms of governance affecting the benefits that different members would realize from their use of the SWIFT network and involvement in standards development.

The notion of [the SWIFT] cooperative changed over time. When I joined in ’88, there was one price for a message. Whoever sent it, and whatever the destinations were....That was the interpretation of a cooperative at that point in time: everybody pays the same thing. It was only later that we started to introduce segmentation by volume....That was a major evolution.

These changes in the structure and capabilities of SWIFT as well as potential contextual factors (such as sector develop-
ments) had significant implications for our understanding of the generative mechanisms in particular historical situations and their effect on bank performance.

These insights into the changes that had happened over time also meant that the intrinsic and extrinsic conditions of closure anticipated in the study had to be rethought. For example, we realized that in our earlier econometric modeling (step 2 in Table 4) we had averaged the effect of SWIFT over 30 years and across the entire SWIFT membership (more than 3,000 diverse banks), which in light of the qualitative findings suggested that changing benefits for different members over time was not appropriate. We therefore needed to redraw the boundaries of possibility and create revised conditions of quasi-closure; in other words, this phase of our study led us to challenge our quantitative findings and revisit our model in order to apply a new set of controls and restrict our analysis to specific samples that would give us results in chronological categories as well as distinguish between bank size and type. Therefore, taking into account these qualitative insights on the context as well as SWIFT itself would create more focused demi-regularities.

In order to move forward with this further investigation, we had to isolate the effect of the contingently related and historically specific phenomena from the necessary relations (relying on the properties of SWIFT structures and liabilities) that produced these findings. More practically, by scoping our research, we were trying to satisfy some of the conditions for closure. On the one hand, intrinsic conditions for closure could be achieved by ensuring as little variation as possible “in the object possessing the causal powers”—in this case, SWIFT (Sayer 1992, p. 122). If these conditions were not taken into account, we would be comparing the effects caused from the SWIFT of the past (different standards, technologies, access to knowledge, one price fits all, etc.) with those related to the SWIFT of the future (advanced networking capabilities, business-oriented standards, value of the community, tiered and bundled pricing, etc.). On the other hand, achieving some of the extrinsic conditions for closure would ensure the decrease in external mechanisms or situations that would affect or differentiate the action of particular powers and liabilities in generative mechanisms of SWIFT. For example, the adoption of SWIFT from a smaller bank versus a large bank or a retail bank versus an investment bank could trigger different mechanisms (see Figures 6 and 7).

With these revised conditions of closure in mind, we broke up our sample into different, more homogenous, subsamples and reexamined our initial relationship between SWIFT adoption and bank performance. This further round of analysis (summarized in step 4 of Table 4) at a different level of granularity uncovered some key demi-regularities. First of all, by differentiating between small banks and bigger banks we were able to identify that smaller banks were, on average, correlated with substantial boosts in performance, whereas larger banks were very slow in realizing significantly lower and somewhat ambiguous performance results. In addition, most of the effects on performance ratios were correlated with revenue streams instead of expense cuts, something that was counter-intuitive and not consistent with the majority of our interview data. Finally, there was some indication that these patterns were primarily driven by retail banks and late adopters in our sample. These demi-regularities, achieved by assuming a considerable degree of closure, revealed some nonobvious findings, which provided additional information and drove another round of qualitative enquiry that would dig even further beneath the surface in order to uncover the necessary relations (excluding any contextual relationships) and causal powers that SWIFT holds at a certain point in time, and how they cause the increased performance of banks (if at all). Through this process we were able to further assess the internal validity and robustness of our findings, as qualitative data enrich and substantiate causal explanations coming from statistical covariations (Modell 2009).

Having identified these demi-regularities, we sought to conduct a case study in a small retail bank (step 5 of Table 4) and supplement it with other sources in order to investigate the mechanism under which SWIFT can potentially add value to financial institutions in this context. One of the key interviews with the head of a bank in the UK, who was personally responsible for the adoption of SWIFT, produced narratives that were consistent with the relationships illustrated in the extensive research and provided significant insights into SWIFT implementation and the specific benefits that it generated:

There was an appreciation that [installation] of SWIFT would improve our service, but it would also drive up our costs...there was feedback from our marketing effort, which said that we would be able to increase our business, increase our volume, if we have SWIFT...a number of relationships that we had been trying for, visiting those banks, our corresponding banking department, marketing efforts, etc., they actually crystallized after we installed SWIFT.

The above description provides useful information on the value-generating mechanism activated by the adoption of SWIFT and underlines the necessary components and liabilities that trigger these mechanisms (see Figure 7). For example, SWIFT, as a common standard, and network tech-
technology that provides connectivity and access to other banks (necessary and internal relations) enabled the small retail bank at one point in time (contingent conditions) to increase revenues and eventually boost its performance. Specifically, SWIFT was instrumental in adding value by attracting new clients and providing SWIFT-related products: “We are processing and providing service to our correspondent banks that we previously were not able to provide.” On the contrary, SWIFT-related costs seemed to be a negative factor for such a small bank; one of our interviewees pointed out that “if we could relate costs to SWIFT, we would have gone [to SWIFT] many years ago.” This difficulty was also confirmed as an issue from other SWIFT employees who raised concerns for the high total cost of ownership (TCO) for smaller banks. It is important to note that while the dynamics involved in realizing SWIFT benefits were similar to the demi-regularities uncovered, the mechanism that drove these dynamics could have not been uncovered without additional qualitative insights and explanations:

I’d say that over the first year, definitely over the first 12 months, our profit margins came down. And then, the two things that we did, one, we were able to increase our transactions, and two, we were able to rationalize all the interface building that we did, which further increased our capacity.

The evidence from the case study suggests that, under different circumstances (e.g., of a small retail bank which adopted SWIFT late in the diffusion curve), the same or similar causal powers and liabilities can be exercised (or remain unexercised), leading to different mechanisms and generating different results on how a bank realizes the benefits from SWIFT. Figure 7 depicts the (causal) powers and liabilities underlying the mechanisms in action for small retail banks, which are also highlighted in step 5 of the retroductive process shown in Table 4.

The combination of quantitative and qualitative methods helped us gather evidence about the characteristics of banks and the powers, capabilities, and liabilities of SWIFT in different periods and allowed us to create (quasi-)closure in order to capture robust demi-regularities. This gave us confidence to generalize and suggest that the generative mechanisms observed in our case study will also apply to other small retail banks in our sample and thus will drive the bank performance effect observed in the demi-regularities (see Figure 7). The establishment of external validity does not just demonstrate the premise that our assumptions for the existing mechanisms will apply to other similar contexts, but also denotes a causal statement that links SWIFT adoption with bank performance through the realization of the generative mechanisms identified. This causal link is the main
property of internal validity, which ensures that the events we observe are manifestations of particular generative mechanisms in a particular context (see Table 1 and Figure 3).

Apart from abstracting the powers and liabilities of SWIFT from their context, a critical element of the retroductive process is to engage in concrete research and investigate how these powers and liabilities play out in the real world while being influenced by the external and contingent factors (external mechanisms). In this regard, the interview data proved informative because it offered situated insights and interpretations of how these contingent factors influence the change that is generated from the mechanisms of SWIFT. For example, we found that some of the issues influencing the impact of SWIFT on firm performance were external and bound to broader developments both within the sector and outside it (for example, the invention of the Internet Messaging Protocol). As the SWIFT network grew and the development of standards extended from international payments to other parts of the financial transaction life cycle, more diverse institutions began to request membership and connectivity to SWIFT (e.g., broker-dealers in securities, other sector infrastructures such as CREST). Thus, the importance of the context (global financial sector and the needs of the banks at the time) was immensely critical to how the powers and liabilities were realized and hence to the effect of SWIFT on bank performance.

The above description shows not only the value of mixed-methods in providing closure, and hence abstract explanations of how the events we observe are produced, but also the role that the critical realist ontology and retroductive methodology plays in facilitating a critical methodological pluralism closely linked to its meta-theoretical assumptions (Danermark et al. 2002). As Table 4 outlines, the main steps in our retroductive process and the key findings and contributions from each method led us to the use of different methods that enabled us to construct our abstractions, perform research at the concrete level, and revise the conditions of closure to achieve more robust validity. In prior literature, the emphasis has been on combining the output of qualitative and quantitative studies at the end of a study to form end-game meta-inferences (Venkatesh et al. 2013). In this study, the CR approach guided the dynamic interplay and responsive mode of analyses that not only mutually informed our findings but increased their validity by systematically challenging and revising the conditions of closure and by asking “why” questions in order to assess the causal explanations (Runde 1998).

A further way in which our CR mixed-methods approach improved the quality of contribution made by our study was to ensure construct validity in both our qualitative and quantitative studies. This was apparent throughout the study but was of particular valence when the differences in findings from the intensive and extensive methods motivated us to deconstruct the implementation of SWIFT into historical phases in order to get a deeper understanding of the timing of SWIFT adoption. Through the combination of methods, we were able to assess whether the variable used in our quantitative study provided robust findings about events at the level of the actual. In other words, was our SWIFT adoption variable an empirical trace of the actual events and did it correspond with what happened in reality regarding the physical implementation of SWIFT and also with what the community agrees to be the norm? The latter is important because while the physical implementation of SWIFT can indeed be accurately measured, the realization of SWIFT adoption also implies its usage. While we did not have access to representative firm-level usage data, we uncovered qualitative evidence suggesting that due to the costs involved when banks adopt SWIFT, they tend to take advantage of its capabilities as much as possible and justify its use, thus making the SWIFT adoption variable a good proxy of SWIFT usage. In parallel, due to the diverse environment and governmental complexities of SWIFT, which were recovered from our archival research, we felt that we had to complement our study with a variety of interviews (see Table 5 for the number and type of interviews conducted), which would further enhance our construct validity.

Assessment and Elimination Stage

As the research progressed, the analysis of data from intensive/extensive methods provided possible narratives for the relationships and the empirical events observed which enabled us to eliminate alternative explanations for the generative mechanisms causing the phenomena we encountered. In this regard, the activity of elimination implicitly took place throughout the retroductive process as we assessed the different results coming from the intensive/extensive methods and decided on next steps to further investigate more probable explanations for the empirical phenomena. This corresponds with the column “assessment and next steps” in Table 4, where the main implications of the different retroductive steps and their role in guiding the way forward are described. Eventually, in the elimination stage at the conclusion of the analysis (see step 5 in Table 4), we considered the different theories that could provide explanations and complement the empirical findings.

Overall, even though it was pointed out to us early on that “a bank without SWIFT is like an office without a phone” implying the commoditization of payment technologies in
### Table 5. Number and Type of Interviews

<table>
<thead>
<tr>
<th></th>
<th>Number of Interviews</th>
<th>Positions</th>
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</thead>
<tbody>
<tr>
<td>SWIFT</td>
<td>49</td>
<td>9 Executives; 13 Directors; 27 Managers</td>
</tr>
<tr>
<td>Other financial services infrastructures</td>
<td>4</td>
<td>DTCC; Euroclear; SEPA</td>
</tr>
<tr>
<td>Banks</td>
<td>14</td>
<td>3 Executives; 5 Directors; 6 Managers</td>
</tr>
<tr>
<td>Technology and consulting companies</td>
<td>3</td>
<td>3 Directors</td>
</tr>
<tr>
<td>TOTAL</td>
<td>70</td>
<td></td>
</tr>
</tbody>
</table>

banking and the inability to create competitive advantage, we were able to construct more powerful narratives that described the mechanisms through which members achieved value through SWIFT membership. Having said that, these distinctive mechanisms proved to be historically specific since the nature of SWIFT adopters and the organization of SWIFT has shifted over time. If the initial findings had not been placed in the context of a historical narrative the results would have been very misleading and may likely have imposed a trans-historical explanation to time-bound objects. Similar robustness checks were applied to our use of other methods; for example, without the quantitative analysis that uncovered important demi-regularities for small retail banks (step 3 in Table 4), it would have been very difficult to further explore the role of the type and size of banks as well as the timing of benefits realized from SWIFT adoption. Conversely, with quantitative methods alone, it would have been impossible to hypothesize about the generative mechanisms that led to the relationship between SWIFT adoption and bank performance.11

The above illustration of our MM IS research example highlights the importance of both the abstract knowledge of mechanisms and the empirical knowledge of contingent relations (concrete). It is thus assumed that the incompleteness of the explanations of mechanisms and the lower quality of meta-inferences can come from the lack of either of these two, since they are very closely related (Sayer 1992). It is, therefore, the aim of the retroductive framework to ensure that abstract research (analyzing objects in terms of their constitutive structures and causal powers) as well as concrete research (study the consequences of combining these with other contingent conditions) are performed in this process. Ignoring this stratified ontology and relying only on observations (e.g., that “X is generally followed by Y”) can be very misleading, as we saw that the same mechanism can sometimes generate different events and vice versa.

In addition to the empirically discovered contingently related phenomena, theoretical propositions must be combined in order to move back from abstract concepts to the concrete (Sayer 1992). In our case, for example, IT and productivity theory argue that additional investments in technology and implementation of supplementary business processes could delay the streamlining of IT with the rest of the business but eventually add significantly to the overall bank performance. Similarly, the theory of network externalities highlights the power of networks to create value through connectivity to an increasing user base of a specific network technology. These theoretical claims inspired a set of research questions in order to identify similar effects: Does SWIFT adoption follow the standard S-shaped curve? Does SWIFT add more value to its members as the number of adopters grows? Eventually, the overall impression we got from our fieldwork interviews and archival work was that complementarities related to SWIFT adoption also played an important role for the actualization and timing of the benefits. This relationship (which was confirmed with our qualitative work) and the notion of network effects could also provide explanations about the large coefficients of SWIFT adoption and the long lags to performance.

### Discussion

Recent methodological developments in IS research have established guidelines for mixed methods (Tashakkori and Teddlie 2003; Venkatesh et al. 2013), and the value of critical realism as a theoretical and philosophical approach in the use of case studies (Wynn and Williams 2012) and other methods (Mingers 2000, 2001, 2004) has been noted. However, there has been little exposition as to how the retroductive approach in CR can usefully act as a guide empirically in deploying a mixed-methods study. In this paper, we illustrate the retroductive process in CR by drawing on a large-scale study of...
SWIFT to uncover the generative mechanisms that helped understand the effect of SWIFT adoption on bank performance. Within this retroductive MM process, we demonstrated how the notions of demi-regularities and quasi-closure can lead to improvements in validity and support the development of robust meta-inferences. Forming different abstractions from SWIFT data we managed to identify its constituent factors and theorize about the mechanisms that generate the events we observe (e.g., SWIFT automates processes and creates economies of scale that help banks decrease expenses and increase revenues). However, we realized that, depending on contingent factors (e.g., timing of SWIFT adoption and characteristics of adopters), these effects were distorted, leading to different results (e.g., smaller retail banks didn’t benefit from expense cuts but were able to increase their sales, etc.). Two key points emerged from this retroductive approach. First, our study emphasized the importance of abstract and concrete research and their relationship in the research process, which leads to the identification of causal mechanisms and the formation of meta-inferences. Second, it illustrated the key role of demi-regularities, and of extrinsic and intrinsic closure in ensuring validity and allowing for generalization. We now discuss each of these in turn.

**The Role of Abstraction in Identifying Generative Mechanisms and Forming Meta-Inferences**

Abstractions are a crucial part of the retroductive analysis because they allow us to strip out and separate the constitutive structures and necessary (internal) properties of the objects we are studying from the contingent (external) ones that affect the events we observe (Sayer 1992; Tsoukas 1989). Within this process, mixed-methods played a key role in identifying generative mechanisms (revealing why things are as they appear) and forming robust meta-inferences that can guide our thinking in different research contexts. In our case, understanding the components and structure (as a set of internally related objects) of SWIFT (e.g., its technological capabilities and network infrastructure, message standards, community and governance, etc.) helped us to theorize about what causal powers and liabilities SWIFT might hold. For example, the ability of SWIFT to transmit payment messages quickly and securely, or the availability of knowledge and expertise from the SWIFT community, provides key information about its potential impact on organizations. On the other hand, concrete research helped us understand what happened when these powers and liabilities were exercised under certain contingent conditions. In our case, these were recovered by employing qualitative methods, including a historical study, alongside econometric analyses to understand the differences between adopters in the early and late years and the different characteristics of financial institutions and the banking sector in the 1970s and the 21st century.

This use of quantitative and qualitative methods was vital in order to identify both internal (necessary) and external (contingent) relations. In the early stage of our research interviews, historical narratives, and quantitative analysis uncovered constituents of SWIFT such as the size of its network, its technological capabilities, governance structure, etc., while, in the later phases, further interviews, archival work, quantitative analysis, and case study enquiry provided information about the contextual factors such as the types of SWIFT adopters, and regional and temporal influences. The interplay between methods not only helped to ensure completeness and complementarity in our study but also advanced our research strategy by enabling us to build on the results from different methods and develop a systematic process of inquiry through retrodution. Finally, different methods were used to compensate for the limitations of the other methods and thus provide diversity by looking at different levels of abstraction as shown in Table 3.

The identification of causal mechanisms through abstraction and concrete research has commonalities with meta-inferences in MM research as both concepts effectively use quantitative and qualitative methods (Tashakkori and Teddlie 2003; Venkatesh et al. 2013). However, there are some key differences. Meta-inferences are often described as a merge between the quantitative and qualitative inferences once a research enquiry has come to an end. However, our study highlights the identification of generative mechanisms as an iterative and nonlinear retroductive process where quantitative and qualitative methods work in conjunction and feed into each other until a robust mechanism that can explain the phenomena is recovered. Further, the main route of developing meta-inferences is principally an inductive one (Venkatesh et al. 2013), while the identification of causal mechanisms is driven by a creative retroductive process (Mingers 2004, 2005). Had we used a linear inductive approach to meta-inferences that combined findings from the two different types of research (extensive and intensive), we would have been confronted by conflicting views on the impact of SWIFT on organizations. For example, our initial interviews supported the argument that SWIFT is a neutral plumbing of the banking sector that did not add to the bottom line performance of banks, whereas statistical findings demonstrated a robust correlation between SWIFT adoption and measures of financial performance. The retroductive logic allowed us to go beyond the conventional synthesizing of the results and question the assumptions and conditions (i.e., degree of closure and contingent factors) under which
they were produced in order to uncover the generative mechanisms.

**Demi-Regularities and Validity Through Closure**

In our paper we also demonstrate how demi-regularities not only focus the research design but also facilitate the hypothesizing and generalizing about existing causal mechanisms. In addition, we show that they can also help to assess and explain the results in the analysis phase. By acknowledging that social systems are inherently open, and thus observable, events are a result of complex interactions between several causal mechanisms that may offset each other. We highlight that conditions of closure are imperative to establish these demi-regularities and produce valid generalizations and causal arguments. For that reason, we show how intrinsic and extrinsic quasi-closure was important in our study in establishing validity, and in particular providing some possible generalized statements about the real mechanisms in place by merging them with actual events (Tsoukas 1989).

For example, intrinsic closure in our study was achieved when we restricted our research to reflect no qualitative variation in SWIFT, that is to say, when the necessary constituents of SWIFT remained largely unchanged during a specific period of time. In parallel, extrinsic closure, which required that the external mechanisms in the environment of SWIFT (e.g., the country or region of use, the timeframe, the type of adopter organizations, etc.) are constant, was achieved when we restricted our sample to a particular set of banks of specific type and size. Once these two conditions were applied we could argue that the demi-regularities observed in terms of event correlations could be a manifestation of a causal mechanism recovered during the interplay between the abstract and concrete research.

In our example, we demonstrated how with the use of MMs we managed to narrow our study down to a specific subsample where the two closure conditions could be met. For example, through the interviews we conducted, we realized that certain intrinsic aspects of SWIFT changed over time, so we had to confine our quantitative study to particular periods where there wouldn’t be much qualitative variation of these aspects (intrinsic closure). As Runde and de Rond (2010) note, not only is it necessary to embrace that the questions asked and answers given by people depend on their interest and situation, but more importantly this kind of situatedness, given the impossibility of citing all the causes of an event, is in fact a resource that makes causal explanations feasible at all. The reason for this has to do with our why-questions always being from a point of view, thereby always focusing on one or other aspect of some event…. That people always come to things and ask about them from a particular (subjective or situated) point of view, rather than from what Nagel (1986) calls the “view from nowhere,” provides the necessary restriction on the cases we need to cite in any particular explanation (p. 436).

The qualitative methods were boundary-making, helping us to narrow the range of issues in our inquiry, revise the scope of (quasi-)closure at work, as well as forming part of the elimination process by which we moved the study forward.

Meanwhile, through our statistical analysis, we uncovered a correlation between smaller retail banks and SWIFT adoption. As a result, we restricted our qualitative study to that domain of small retail banks and we were able to isolate and uncover the mechanisms that lead to increased bank performance without the influence of other objects and mechanisms (i.e., extrinsic closure). Meeting these conditions allowed us to generalize our findings and argue that within that specific domain (that of a small, late-adopter retail bank) the application of SWIFT led to increased performance. This generalization in the form of internal (establishing a causal link between events) and external (generalizing the same mechanism between different banks) validity was achieved through closure and the recovery of robust demi-regularities in the process of our retroductive approach to mixed methods.

Theory generation in CR lies on the development of abstractions that hypothesize about and identify generative mechanisms (rather than regularities) that are observed in different contexts and are expressed by means of empirical categories—empirical generalizations (Danermark et al. 2002). In that respect, generalizing means to identify universal structures or mechanisms that are theorized to exist in different contexts but not necessarily cause the same events (Wynn and Williams 2012). Therefore, in our study, the process of generalizing the findings was not focused around replication of the correlation in a different context but rather, through the use of MM, it examined the links between generative mechanisms in different contexts, for example, in other small retail banks. Our study also identifies different levels of generalization. For example, going from a specific case study to a small sample (Seddon and Scheepers 2012), and from there to the wider population, so as to provide explanations in other contexts (Lee and Baskerville 2003; Lee and Hubona 2009; Seddon and Scheepers 2012; Venkatesh et al. 2013).
Conclusions

In this paper, we contribute a deeper understanding of the role of causality and validity in the retroductive mixed-methods approach of critical realism by leveraging CR’s rich ontological assumptions (Danermark et al. 2002; Sayer 1992) and by adopting its “attitude of epistemological modesty” (Runde and de Rond 2010, p. 433). The stratified ontology of CR and the notion of generative mechanisms as the causal link between the real and the empirical motivated us to consider the use of diverse strategies for mixing intensive and extensive methods in our study of the impact of SWIFT adoption on bank performance. We illustrate how the logic of retrodaction can guide a productive and dynamic interplay between methods involving constant comparison in our CR-inspired, mixed-methods approach. By exploring the interaction between situated narrative and statistical descriptions of populations we are not only better able to uncover generative mechanisms but also to have stronger validity claims, which help us to develop more robust meta-inferences. In the process, we demonstrate the significance of abstract and concrete research in identifying internal (necessary) properties of the exercised and unexercised mechanisms based on the external or contextual conditions and how, by systematically challenging and revising conditions of closure, we were able to uncover unobvious demi-regularities while enhancing the validity of our study.

We believe that the methodological implications of critical realism we have advanced in this paper go beyond the single CR-led case study methodology that has characterized previous studies in this literature (Wynn and Williams 2012). In so doing, they may provide useful insights for others to pursue retroductive analyses of in-depth mixed-methods IS research. We suggest that future research could usefully examine the critical dimension of CR by exploring the exercised and unexercised mechanisms influencing ICT innovation in particular sectors. Using a CR-led mixed methods approach in IS research can fruitfully challenge accepted conventions in particular sectors. Using a CR-led mixed methods approach in IS research can fruitfully challenge accepted conventions in particular sectors. Using a CR-led mixed methods approach in IS research can fruitfully challenge accepted conventions in particular sectors. Using a CR-led mixed methods approach in IS research can fruitfully challenge accepted conventions in particular sectors.

References


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