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Methodology in Critical Realist Research: The Mediating Role of Domain-Specific Theory

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ABSTRACT

Critical realism holds promise for IS researchers who wish to treat technology as a material artifact, work within an explanatory framework, and take into account the role of context. It is widely acknowledged, however, that critical realism itself does not provide a methodological basis for conducting empirical studies. We therefore seek to provide methodological guidance in the conduct of critical-realist based research. Our thesis is that the most appropriate method for conducting critical realist research depends on the strength (relevance or appropriateness) of the domain-specific theory that the researcher can bring to bear on the issue. We present three types of methods for critical realist research, structured, structurable, and unstructured, which correspond to the availability of strong, related, and weak domain-specific theory, respectively.

KEYWORDS

Critical realism; problem structure; domain-specific theory; structured, structurable, and unstructured research methods

INTRODUCTION

Since its origins (Bhaskar 1979), critical realism has gained recognition as a particularly appropriate philosophy for the social sciences. Furthermore, it is now gaining currency in the IS community. A number of recent IS publications have addressed largely philosophical and conceptual issues (among them: Carlsson, 2005; Dobson, 2001; Mingers, 2004; Mutch, 2002). Further, empirical studies are now starting to emerge (e.g., Volkoff, Strong, and Elmes, 2007).

The key premises of critical realism are ontological realism, epistemology relativism, and judgmental rationality. Ontological realism implies that there is a reality that exists independently of one’s knowledge of it. Critical realism therefore establishes a role for material artifacts, such as information systems and technologies, which exist prior to any engagement with human agents, thereby allowing researchers to theorize about technological artifacts. Epistemological relativism implies that knowledge is conditioned by our prior social and historical knowledge and experiences rather than being immutable. Critical realist (CR) studies therefore involve interpretive forms of investigation. Judgmental rationality implies that one can apply logic to determine whether certain theories are more effective than others (Wikgren 2005).

A key aspect of critical realism is its focus on causality and identifying causal mechanisms (Danermark, Ekström, Jakobsen, and Karlsson, 2001; Mingers, 2004; Morén and Blom, 2003). Causality is identified via a stratified ontology that consists of three overlapping domains: the real, the actual, and the empirical. Figure 1 presents the characteristics of, and relationships among, the three domains. Using this ontology, researchers can go beyond empirically-observed events to determine the causal mechanisms in the real domain that result in those events, unlike positivism and interpretivism with their flat ontologies, which operate only in the empirical domain (Mingers, 2004; Reed, 2001; Wuisman, 2005). The actual domain consists of all possible events that may be generated by the causal mechanisms, only some of which will be actualized (or realized), and therefore manifested in the empirical domain. Hence, though not predictable, outcomes can be explained.

Causality in critical realism is closely related to the context (Archer 1995). Because different outcomes arise from a set of causal mechanisms due to changes in the context, certain events will be manifested only when a certain set of conditions is present. Hence the critical realist perspective can explain why so-called factor or variance research in IS has failed to produce consistent findings across studies (e.g., Markus and Robey 1988). Further, CR-based research overcomes the issue with the use of structuration theory, that is, the fact that structuration theory conflates structure and agency. Because CR research acknowledges the inherent materiality of technology, it allows us to examine the interplay between technology and the organization (Volkoff et al. 2007).
Nothwithstanding the appeal of the CR paradigm, the issue of how to conduct CR research studies remains underdeveloped. There are, in fact, few published CR studies and those that have appeared lack rigor (Stones, in Archer, 1999). Further, critical realism itself does not seek to offer a research method. Rather, its role has been viewed as offering “guidelines for social science research and starting points for the evaluation of already established methods” (Danermark et al., 2001; see also: Archer et al., 1999; Sayer, 2000; Shields, 2003; Wuisman, 2005).

Figure 2 positions methodology between social ontology and social theory (Archer 1995). This notion is supported by Stones, for example, who states that: “The link … between these indeterminate ontological concepts and research outcomes is not at all transparent or straightforward, and in critical realism (and probably most social science in fact) it is underdeveloped, undervalued and neglected in a damaging way.” Hence, there is significant agreement that there is a middle ground that mediates the relationship between ontology and empirical research and, further, that the middle ground centers on research methodology.

In this research, we respond to such calls for “guidelines” in conducting CR research by focusing on its heavy reliance on theory (Danermark et al. 2001). Fleetwood (2005), for example, underlines the importance of theory: “Unlike various forms of naïve or empirical realism, critical realists accept that there is no (defensible) theory-neutral observation, description, interpretation, theorization, explanation or whatever. There is, in other words, no unmediated access to the world: access is always mediated.” We first present a theoretical analysis that suggests that the extent of theoretical development in the domain under investigation mediates the relationship between a social ontology and the conduct of social research, thereby determining the type of methodology that can be used. We then identify three types of research methods based on varying levels of strength of the domain-specific theory that can be brought to bear on the research problem, and illustrate them with published studies.

**ROLE OF STRENGTH OF EXTANT DOMAIN-SPECIFIC THEORY IN CRITICAL REALIST METHODOLOGY**

Our approach to addressing the middle ground between the CR ontology and empirical research focuses on the compatibility or fit among domain-specific theory, the research problem, and the research method. Figure 3 presents our conceptual model of the research process.
The key to our analysis is the degree of structure in the problem under investigation (Newell and Simon 1972). Our thesis is that the strength of extant domain-specific theory determines the degree of problem structure, while, in turn, the degree of problem structure determines the degree of structure in the problem-solving method used to address the research issue(s).

Table 1 presents the three types of situations that we identify in our analysis.

<table>
<thead>
<tr>
<th>Type of Critical Realist Research</th>
<th>Type of Domain-Specific Theory</th>
<th>Type of Problem</th>
<th>Type of Research Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I</td>
<td>Strong</td>
<td>Structured</td>
<td>Structured</td>
</tr>
<tr>
<td>Type II</td>
<td>Related</td>
<td>Structurable</td>
<td>Structurable</td>
</tr>
<tr>
<td>Type III</td>
<td>Weak</td>
<td>Unstructured</td>
<td>Unstructured</td>
</tr>
</tbody>
</table>

Problem structure can be conceptualized in four ways: 1) the existence of a well-defined goal state; 2) the complexity of the problem space relevant to its solution; 3) the extent of knowledge in “problem-relevant” domains; and 4) deficiencies in one’s problem-solving process (Smith, 1988). In our analysis, we conceive of problem structure in terms of “the extent of knowledge in problem-relevant domains” (Smith, point 3), which we view as determined by the strength of relevant domain-specific theory. When strong domain-specific theory exists, the problem can be viewed as structured; when the domain-specific theory is weak, it can be viewed as unstructured. When the extant theory is related only indirectly to the problem at hand, or perhaps not readily identified as relevant, then the problem can be viewed as structurable. In this instance, we refer to related domain-specific theory.

Further, the structured nature of the problem, and therefore the strength of domain-specific knowledge, is related to the ability to solve the problem (Smith, point 4), which we capture in “the type of research method.” When the problem is structured, the problem solver can readily identify a strategy for solution (Greeno 1978; Sinnott 1989; Smith 1988; Spence and Brucks 1997; Voss and Post 1988). Hence, structured problems can be addressed using structured (or strong) problem-solving methods that are specific to the problem at hand (Newell 1969). On the other hand, unstructured problems, which can be addressed only using problem-solving methods that are unstructured or exploratory in nature (Chi and Glaser 1985; Smith 1988), result in the use of inelegant problem-solving methods (Alexander and Judy 1988). Such methods are therefore weak in nature (Newell 1969). A problem that is structurable can be solved with additional information or by reformulating the problem into solvable sub-problems eventually resulting in solution of the problem as a whole (Smith 1988; Spence and Brucks 1997). Hence the problem-solving method that can be used to solve structurable problems can be regarded as structurable in nature.
RESEARCH METHODS FOR CRITICAL REALISM BASED ON STRENGTH OF DOMAIN-SPECIFIC THEORY

For one of our three methods, we draw on a published model and example. For our other two methods, we present high-level descriptions, which are intended to be illustrative rather than definitive.

The research studies that are amenable to examination using a CR approach are those that focus on the relationship between structure and agency (Scott 2005). We must therefore be sure to choose research studies that allow us to understand such relationships (see, also, Archer, 1995), and not those that foreground either structural or agential perspectives or those that foreground neither structure nor agency, as in studies interpreted using structuration theory (Giddens, 1984). We examine studies that use in-depth qualitative research approaches because qualitative data provide rich accounts of causal relationships (Modell, 2007). Note, however, that there is some debate about the role of quantitative studies and multi-method studies in CR research (Mingers, 2004; Modell, 2007; Scott, 2005).

Strong Domain-Specific Theory Resulting in Structured Research Methods

As we have seen, the availability of strong extant domain-specific theory results in a structured task and therefore a structured method for conducting CR research. Figure 4 presents one model of what we refer to as Type I CR research, which is based on our example study by Leca and Naccache (2006).

Leca and Naccache (2006) conducted a CR analysis of ARESE, France’s first social rating agency, which was founded early in the era of socially-responsible investment in France (1997). ARESE became the cornerstone for an emerging industry focused on measuring corporate social performance.

One of the principal motivations for their study was to overcome institutionally-embedded agency inherent in institutional theory by developing a non-conflating view of institutions. Their thesis, which is based in critical realism, is that: 1) institutional logics underlie the formation of any kind of institution, and are therefore in the real domain; 2) because institutions are “self-reproducing recurrent patterns of behavior” that can be identified (at least by researchers), they are in the actual domain; and 3) observations regarding institutions are in the empirical domain. Their resulting model of institutional entrepreneurship therefore addressed change by acknowledging the influence of both structure and agency.

In a pure, three-step retroductive process (see Blaikie 2007) represented in Figure 4, Leca and Naccache investigated how ARESE “contributed to the legitimation and institutionalization of social rating and Socially Responsible Investment (SRI) in France” by: 1) identifying measurement as the structure central to ARESE’s success (via a preliminary investigation); 2) determining the potential causal mechanisms associated with measurement from prior literature (the real domain); and 3) identifying the causal mechanisms that actually pertained (the actual domain), which they achieved by interviewing 8 executives and 38 fund managers, and investigating internal and industry reports (the empirical domain). To identify potential mechanisms, they used literature surrounding measurement, “one of the major structures pervading western
societies since the Renaissance” (Crosby 1997). Therefore strong domain-specific theory was available to them in this Type I CR research. Table 2, which summarizes the theoretically- and empirically-derived mechanisms, shows that there was a significant, though not total, overlap in the mechanisms.

Perusal of Figure 4 shows the structured nature of the research method that results from the availability of strong domain-specific theory. The path to the desired outcome is readily determined, and the research proceeds in 3 readily-identifiable, unproblematic steps.

<table>
<thead>
<tr>
<th>Potential (Theoretically-Derived) Causal Mechanisms</th>
<th>Identified (Empirically-Derived) Causal Mechanisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Measurement results in the object being regarded as “scientific” because numbers are likely to be viewed as facts.</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td>3. Measurement uses common units thereby supporting standardization.</td>
<td>✓</td>
</tr>
<tr>
<td>4. Measuring facilitates comparison among different objects.</td>
<td>✓</td>
</tr>
<tr>
<td>5. Measures allow judgments to be mechanized.</td>
<td>✓</td>
</tr>
<tr>
<td>6. Measures facilitate transfer of data.</td>
<td>Implicit</td>
</tr>
<tr>
<td>7. Measures facilitate trading the items measured, thereby facilitating the development of new markets.</td>
<td>✓</td>
</tr>
<tr>
<td>8. Common measures foster the feeling of a common identity within the community.</td>
<td>Not observed</td>
</tr>
<tr>
<td>9. Measuring facilitates legitimizing the activity in the eyes of the stakeholders.</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td>10. Measuring instruments increase the power of the measurers.</td>
<td>Not foreseen</td>
</tr>
<tr>
<td>11. Measurement can be used to control the measured object.</td>
<td>Not observed</td>
</tr>
</tbody>
</table>

Table 2: Comparison of Potential and Identified Causal Mechanisms in the Type I Research of Leca and Naccache (2006)

Related Domain-Specific Theory Resulting in Structurable Research Methods

Figure 5 presents a published, verbal model of what the researchers refer to as a model of “an explanatory social science” and “an explanatory model of critical realism,” and what we refer to as a structurable method for conducting CR research (Danermark et al., 2001). We present an overview of both their method and a related research study (Roman 1994; in Danermark et al., 2001, pp. 111-112).

Danermark et al. (2001) base their model on the assumption that the “fundamental structures of an explanatory social science can be described as a movement from the concrete to the abstract and back to the concrete.” For Danermark et al., “the concrete” refers to an empirical study, while the abstract refers to conceptualization, abstraction, and the modes of inference of abduction and retroduction. The six stages in Danermark et al.’s model do not necessarily occur in sequence: there may be iterations among stages and some stages may be emphasized to a greater extent than others. In Figure 5, to show the possibility of iteration, we show the four abstract stages inter-related by bi-directional arrows.
We discuss briefly each of the stages in turn.

**Stage 1: Description** focuses on identifying a concrete event, dilemma, or situation for further analysis. Description may be supported by an exploratory study to identify the objects of interest.

**Stage 2: Analytical Resolution** is concerned with identifying the important components, aspects, or dimensions of the issue under study.

**Stage 3: Abduction/Theoretical Redescription** consists of “redescribing” the components and aspects of interest based on theories about structures and relations, as well as conceptual thinking, a process known as abduction. According to Danermark et al., the researcher should identify a number of different theoretical interpretations and explanations, and should compare and integrate them where possible. (See, also, Wuisman, 2005.)

**Stage 4: Retroduction** involves asking oneself how the components and aspects of interest may have arisen, that is, what causal mechanisms might result in such observations.

**Stage 5: Comparison Between Different Theories and Abstractions** results in assessing the relative explanatory power of the mechanisms and structures identified in Stages 3 and 4. One theory could play a major role; there may be a number of competing theories; or there may be a number of complementary theories.

**Stage 6: Concretization and Conceptualization** involves examining the different structures and mechanisms that are manifested in practice. The important issue is to determine the way in which “mechanisms interact with other mechanisms at different levels, under specific conditions” (Danermark et al., 2001). Researchers should seek to: 1) to interpret the meanings of the mechanisms as they appear in a specific context; and 2) to offer explanations of manifested events.

Next, we present a summary of Roman’s (1994) study as an example of the use of Danermark et al.’s method. Roman examined whether Swedish “knowledge companies” engaged in gender segregation. In **Stage 1**, the author described the phenomenon based on a review of the literature. In **Stage 2**, she divided the phenomenon under investigation into a number of potential causal components, choosing to focus on social issues (i.e., gender-typical lines of actions and special treatment that was negative in nature). They were viewed as empirical manifestations of a number of mechanisms that, under certain circumstances, result in a gender-segregated labor market, e.g., division of labor, generalized socialization, and male career conditions. The mechanisms were located in both the family structure and in the working life structure.

In **Stage 3**, the author addressed each of the above structures by identifying potentially-relevant social theories, and using them to carry out a re-description of each structure. These re-descriptions helped identify a number of possible underlying causes and plausible explanatory models. Note that the analysis to date moves from empirical, concrete phenomenon towards the generative mechanisms. Because we are investigating an open system, there are a number of possible mechanisms, not all of which are equally plausible. The author therefore next asked what are the mechanisms in the two social structures that can
produce gendered segregation? Hence, in Stage 4, Roman identified and described several fundamental causal mechanisms, such as gendered job-splitting, gendered socialization, and male career conditions.

In Stage 5, she weighted and compared the mechanisms for their relative explanatory power, among other things. Figure 6 shows the more important of the mechanisms identified (Roman 1994, p. 84).

![Diagram of Conceptualization in the Research Process](image)

**Figure 6. Illustration of Conceptualization in the Research Process (Roman 1994)**

In Stage 6, the analysis moves back to the concrete. Specifically, the author examined whether previously-identified gender segregating mechanisms were operating in her situation. “Testing” the hypotheses related to the generative mechanisms was carried out via theoretical and empirical comparisons. As well as confirming the existence of the most important causal mechanisms, Roman also identified some mechanisms that did not support her thesis. She alternated between theoretical and empirical considerations to evaluate their importance.

We can readily see that Danermark et al.’s (2001) methodology for conducting CR research is an example of what we view as a Type II CR research method. Although extant domain-specific theory is used extensively during the research process, it originates from a number of different, though related domains. Although the research process is not structured from the outset, it is structurable, as is evidenced by the fact that the authors succeeded in developing an established methodology consisting of six well-defined stages.

**Weak Domain-Specific Theory Resulting in Unstructured Research Methods**

As we have seen, when no domain-specific theory can be identified ex ante as either directly or indirectly applicable to the issue at hand, the method leading to the identification of causal mechanisms will be unstructured in nature, the data itself will necessarily play a substantial role, resulting in what we refer to as a Type III research method. The process of theory development is an interplay between conceptualization and theory construction (Ekström 1992): “Conceptualization and theory construction refer to a process whereby we abstract from context-dependent data in an endeavor to capture the not-directly-observable causal mechanisms that generate observable phenomena and events” (pp. 116-117). We can identify two examples of this type of CR research: Volkoff et al. (2007) and Williams (2007). Figure 7 presents one model of Type III CR research, which is based on our example study by Volkoff et al.
We suggest the use of the grounded theory method (Glaser, 1978, 1992, 2005; Strauss and Corbin, 1998) for analyzing data in a Type III study. Partington (2000) supports the use of a grounded theory approach when “pre-existing theoretical frameworks are likely to be fragmented and rudimentary.” Note that we do not distinguish between Glasserian and Straussian approaches here.

The study that we examine as our example of Type III CR research (Volkoff et al., 2007) used a grounded theory method with a CR approach to examine “How does a technology mediate organizational change?” They conducted a longitudinal field study of the latter stages of implementation and subsequent use of an enterprise system (ES). Note that use of the three-level CR ontology facilitates analysis and subsequent theory development by viewing technology as an artifact that exists independent of any human agent, in contrast, as we have seen, with the IS community’s currently-preferred perspective of structuration theory.

Volkoff et al.’s grounded theory coding resulted in the identification of “embeddedness” as the core theoretical category of the technological change resulting from the use of the ES. Embeddedness is perhaps most obvious in the embedding of organizational routines in the software. Following implementation, instead of manual routines, personnel worked with the routines embedded in, and therefore to a great extent dictated by, the software. The researchers further identified embedded roles (e.g., strict work authorizations were embedded in the software and no spontaneous workarounds could be introduced) and embedded data (e.g., the availability and therefore visibility of the data in a single repository changed the responsibilities of the personnel and therefore the way in which they worked) as also influencing the use of the new system. The researchers further identified relationships among the organizational elements as influencing work, which resulted in a cultural change from undisciplined to disciplined and the redistribution of power from those who could perform a variety of tasks to those who knew the system best. Hence the technological change was accompanied by a change in mindset.

The researchers used Archer’s (1995) theory of social change as the foundation for developing theory that focused on the changes characterizing the move from manual to software systems. Specifically, they based their final theory on the three stages of Archer’s morphogenetic cycle (structural conditioning, social interaction, and structural elaboration/reproduction). In addition to their extension of structuration-based research on organizational routines (see extensive research by Feldman and Pentland 2003) to include the material aspects of the technology, their research makes a significant contribution to the literature by identifying embedded roles, embedded data, and change in mindset and control as also playing significant roles in the organizational change that occurs in the context of technological innovation.

Based on our analysis, above, of Volkoff et al.’s examination of the organizational changes that resulted from the implementation of a technological (software) innovation, we can readily see why this is an example of our Type III CR research. The unstructured research method resulted from the fact that there was no domain-specific theory focused directly on their concern, which, in turn, meant that the problem was unstructured. We can also see, however, that a variety of domain-specific theories were called upon in the development of the final theory, demonstrating that domain-specific theories...
play a significant role in unstructured CR research. The difference between this unstructured research method and both the structured and structurable approaches is that an over-riding domain-specific theory cannot be identified ex ante.

**DISCUSSION AND IMPLICATIONS**

Our research seeks to make a theoretical contribution to both the literature on critical realism and that on IS. Specifically, we present theoretical analyses that present domain-specific theory as a key mediator between the CR ontology, on the one hand, and the practice of such research, on the other.

Our approach is based in the problem-solving research of cognitive psychology, which suggests that the type of research method most appropriate to addressing a problem depends on the structuredness of the problem that is being addressed. We identify three levels of structure in the research problem (structured, structurable, and unstructured) that result when the relevant theory focuses strongly on the area of interest (strong domain-specific theory), when it is related to the area of interest (related domain-specific theory), and when there is little or no readily identifiable domain-specific theory (that is, the available theory is weak). The corresponding research methods are viewed as structured, structurable, and unstructured, respectively. At this stage, the approaches we suggest are exploratory in nature and will be subject to adaptation as our investigations progress.

It is interesting to consider the utility of each of the methods we propose. We envisage that most research conducted in the CR tradition may well be more complex than the structured Type I research in which Leca and Naccache (2006) engaged. From the viewpoint of our structurable Type II method (Danermark et al.’s explanatory model of critical realism), we note that the researchers state that: “… much of social science research to some extent goes along in practice with precisely the model we present here” (p. 109). It is our belief, however, that Danermark et al.’s model is particularly applicable to research in a single domain or in areas where multiple domains are readily identifiable. It seems likely that much research that is interdisciplinary in nature cannot be conducted in this manner, that is, by identifying causal mechanisms prior to empirical examination, that is, relevant theory often may not be identifiable prior to data collection and at least preliminary analysis. In these instances, which are typified by our Type III research, we suggest that modified grounded theory research methods are appropriate.

There are numerous opportunities for future research. First, further work needs to be done to determine whether our theoretical analysis of types of research methods will endure over time, or whether a new theoretical foundation can provide a better characterization of types of CR research. Second, we expect that the types of research we have presented will be enriched over time as we both develop, and observe, more examples of research that fit into our three categories. Third, each of the methods, and variants thereof, need to be teased out in more depth than we present here.

**CONCLUSIONS**

There is considerable support for the notion that a CR ontology is necessary but not sufficient for the conduct of CR empirical studies. Critical realism provides both an ontology and a meta-theory, while empirical studies are based in specific (substantive or disciplinary) domains. Hence we propose that theories related to the domain of investigation can play an important role in empirical studies based in the CR tradition.

We present an approach to defining research methods in CR research that focuses on the role of domain-specific theory as a mediator between the ontology and the research conducted. Specifically, we suggest that the strength of the extant domain-specific theory determines whether the research method best applied is structured, structurable, or unstructured in nature.

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