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THEORIES THAT EXPLAIN CONTRADICTION: ACCOUNTING FOR THE CONTRADICTORY ORGANIZATIONAL CONSEQUENCES OF INFORMATION TECHNOLOGY

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Abstract

The potential of information technology to transform organizations has been a consistent theme in the management literature since computers were first introduced commercially in the 1950s. Yet, the empirical literature on information technology's role in organizational transformation has been characterized by mixed findings across studies and contradictory results within studies. This paper treats the "problem" of contradictory findings as an opportunity to examine several theoretical approaches that deal directly with contradiction. The paper discusses several means to address contradictions that occur among studies and within studies, including the use of alternative theories. Four theoretical approaches with the potential to address contradictions directly are then presented. Considered are political theory, organizational culture, institutional theory, and organizational learning. Each of these theoretical approaches expressly accounts for both organizational persistence and change, and each may be located within the metatheoretical framework of structuration. Although differing in their maturity and precision, these theories may account more satisfactorily for the empirical results observed if employed to guide future research on the organizational consequences of information technology.

1. INTRODUCTION

The potential of information technology to transform organizations has been a consistent theme in both the management and information systems literatures since computers were first introduced commercially in the 1950s. Each new generation of technology and each major technological advance is invariably ushered in with energetic claims that organizations as we know them will be radically and fundamentally altered. Leavitt and Whisler's (1958) early prognostications set the tone for later speculations, some of which offered contrasting visions of organizations in the future. Almost four decades later, information technology is still seen as a powerful force enabling radical new designs for organizations (Applegate, Quinn, and Mills 1988; Daft and Lewin 1993; Hammer and Champy 1993; Scott Morton 1991).

While the range of technologies that have fueled such speculation has been tremendous, the logic employed in arguments about their impacts on organizations remains quite simple in conception. Most popular arguments continue to take the form of either "technological imperatives," in which information technology assumes the role of causal agent, or overly rational assumptions about the ease with which managers can conceive and implement complex social change. By these two logics, information technology either transforms organizations directly through the

sheer necessity of using new technologies, or it is employed as a tool for accomplishing known managerial objectives.

The empirical literature on organizational transformation presents quite a different picture of the role of information technology in organizational change. Accumulated studies produce no consistent picture of the effects of advanced technologies on organizational structures or processes (Attewell and Rule 1984; Huber 1984; Kling 1980; Markus and Robey 1988; Nelson 1990; Robey 1977; Swanson 1987), and many individual studies indicate contradictory outcomes from the implementation and use of nearly identical technologies. Such research findings as these generate little confidence in either the technological imperative or management rationality.

The presence of contradictory evidence in any field of study usually motivates the resolution of contradictions through methodological refinements or theoretical elaboration. However, the "problem" of contradictory findings can also be seized as an opportunity to employ theories that deal with contradiction directly (Poole and Van de Ven 1989). A pattern of contradictory findings may be taken at face value as an accurate representation of the phenomenon to be explained rather than an indication of weakness in a body of research. In this paper, information technology is assumed to produce the variety of contradictory organizational consequences actually observed in empirical

research, and several theoretical approaches to explaining these findings are explored. Three types of contradictory findings are identified: studies in which the expected consequences of information technology do not occur, studies in which different organizational consequences result from the use of nearly identical technologies in comparable settings, and studies in which contradictory consequences result from the use of the same technology in a single organization. The paper then identifies four theoretical approaches, currently used in organizational science, with the capability to explain these contradictions: political theory, organizational culture, institutional theory, and organizational learning.

2. CONTRADICTORY OUTCOMES OF INFORMATION TECHNOLOGY

Contradiction is a general term referring to a statement expressing or asserting the opposite of another statement. Common types of contradictions are paradox, irony, oxymoron, and dilemma. While these differ in important ways, they are commonly used as rhetorical devices to create (and later resolve) tension in a story, expose novel insights, and produce humor. By posing a tension between two (or more) apparently incongruous statements, contradictions force creative thinking about how such statements can logically coexist. For example, the paradoxical, yet profound, wisdom of "doing more with less" stimulates the search for ways to overcome resource limitations in creative ways. Likewise, foolish and self-defeating practices may be exposed in oxymorons such as "wildlife management."

Beyond their use as literary devices, contradictions have been used to gain insights into organizational behavior. Astley and Van de Ven (1983) examined the contradictions among numerous theories employed in administrative science, drawing valuable insights from the juxtaposition of opposing perspectives. Poole and Van de Ven suggested the use of paradox to stimulate theory building, offering four distinct methods for incorporating contradictions into theories of organization. Cameron (1986) developed a novel theory of organizational effectiveness out of the requirement that effective organizations simultaneously fulfill seemingly contradictory criteria. Hatch (1994) analyzed the use of ironic humor within a management team, relating the use of irony to the context of uncertainty faced by the team. Contradiction has also been identified as one of several fundamental logics explaining organizational change (Ford and Ford 1994).

3. CONTRADICTIONS AMONG RESEARCH STUDIES

It is important to distinguish between contradictions *among* studies on a similar topic and contradictions that are apparent *within* studies. Contradictions among studies are understood as *inconsistencies* in research and are typically the focus of detailed

review articles on the subject in question. Numerous reviews of the literature on information technology and organizational change have noted such inconsistencies across studies. Robey (1977) and Attewell and Rule, for example, noted that many of the early studies produced equivocal support for Leavitt and Whisler's predictions that computing systems would centralize authority in organizations. Comparable conclusions have been drawn about the impacts of information technology on the quality of work life, employment levels, decision processes, privacy, and individual adjustment (Attewell and Rule 1984; Huber 1984; Kling 1980; Nelson 1990). Swanson noted that constructive theoretical progress toward the resolution of such contradictory findings was minimal (1987, p. 196).

4. SHARPENING THE FOCUS: STRATEGIES FOR RESOLVING CONTRADICTIONS AMONG STUDIES

Three basic strategies for resolving inconsistent findings among studies may be suggested. First, the validity of research findings from individual studies can be evaluated with the goal of ruling out studies that used flawed research methods. Several articles in the information systems literature have addressed important methodological issues such as design of experiments (Jarvenpaa, Dickson and DeSanctis 1985), construct measurement (Davis 1989; Straub 1989), and statistical power (Baroudi and Orlikowski 1989). These articles have assessed research practices across the whole spectrum of information systems research, and their recommendations may be applied directly to research on the organizational consequences of information technology. By depending upon only those studies using unflawed methods, one hopes to establish greater consistency of results in a particular area of inquiry.

A second strategy is to conduct better reviews on substantive research questions and specific technologies. Information systems research has depended primarily upon narrative reviews, in which the author often advocates a favored theoretical solution as the key to resolving conflicting findings (e.g., Nelson 1990). Narrative reviewers sometimes claim that researchers have *a priori* biases (e.g., optimism or pessimism) that color their approaches to research on information technology (Hirschheim 1986; Mowshowitz 1981). One means of overcoming such editorial slants in narrative reviews is to conduct formal meta-analyses (e.g., Alavi and Joachimsthaler 1992). Relatively few meta-analyses have been conducted of information systems research, perhaps because of the relatively few studies on any single research question.

Third, simple theories may be made more elaborate with the inclusion of contingency variables. A common strategy for identifying overlooked contingency variables is to sort available research into groups with similar findings and to search for

potential (but unmeasured) commonalities among the research sites or samples. This strategy was articulated by Attewell and Rule:

We must identify those variables that can account for differential outcomes and examine them in a comparative study of a stratified sample of organizations. Variables include organizational size, industry type, degree of prior routinization or variability of work, degree of dependence upon a professional or high-skilled work force, and the patterns of information usage and information flow associated with the technologies in use. [1984, p. 1189]

This strategy potentially resolves future contradictions by including neglected variables and interaction effects that are assumed to account for differences in results between studies. More recent reviews also employ this strategy and often recommend the inclusion of contingency variables at different levels of social analysis (Markus and Robey 1988; Nelson 1990; Swanson 1987). Incorporating multiple levels of analyses is a useful way to include new variables with the potential to resolve other contradictions involving the relationships among levels (Poole and Van de Ven 1989).

In all of these strategies, the implicit belief is that contradictions among studies can be resolved if evidence is examined more carefully. This belief rests upon faith in an underlying order within the phenomenon being investigated, i.e., that information technology does have predictable consequences for organizations. By refusing to accept all research findings at face value and by more systematically assessing what valid studies actually say, these strategies offer hope of resolving inconsistencies among research studies. However, these strategies do little to resolve contradictions *within* studies.

5. CONTRADICTIONS WITHIN RESEARCH STUDIES

Contradictions within individual research studies differ fundamentally from contradictions among studies. Three types of contradictions may be identified: studies in which the expected consequences of information technology do not occur, studies in which different organizational consequences result from the use of nearly identical technologies in comparable settings, and studies in which contradictory consequences result from the use of the same technology in a single organization.

Studies in which expected consequences do not occur. Numerous studies have revealed that the expected organizational consequences of information technology did not occur, even though researchers and participants expected them to occur. For example, Bjørn-Andersen, Eason and Robey (1986; Robey 1981) sought to explain the organizational changes associated with the

implementation of computer-based systems in eight organizations. However, they found anticipated structural changes in only three of the organizations studied. Likewise, Franz, Robey, and Koebnitz (1986) found mostly "no effect" of a new system to support nursing stations in a hospital. Studies that produce no effect, or effects much less dramatic than anticipated, are contradictory because organizational consequences were expected by the researchers. The search for organizational consequences motivates most such studies, and the failure to produce evidence of expected changes is contrary (and disappointing) in most cases, especially where adequate care went into the design of the research.

A second type of finding in this category is the discovery of unanticipated adaptations, usually by the users of technology. Here, technology apparently plays an important role in realizing the changes that are observed, but neither the researcher nor the participants were able to anticipate or predict such change. Studies of "reinvention" of information technology are representative of this type of finding. For example, Kraut, Dumais and Koch (1989) found that users of a computerized record system ingeniously created a clandestine note-passing facility where no formal electronic messaging feature had been provided. By leaving notes in a field of the database record intended for customer comments, users were able to communicate with each other through the system. Ironically, one of management's apparent intentions in implementing the system was to increase efficiency by removing such opportunities for social interaction. Other studies of user adaptations offer ample evidence of this type of contradictory finding (Johnson and Rice 1987; Tyre and Orlikowski 1994; Yetton, Johnston, and Craig 1994; Zuboff 1988).

Studies in which different consequences result from the use of nearly identical technologies in comparable settings. A growing number of studies reveal contradictory outcomes from the implementation of nearly identical technologies in comparable settings. Barley's (1986) study of computerized tomography showed different effects on social roles in two hospitals. Robey and Sahay (1995) found completely different social consequences resulting from the implementation of geographic information systems in two county government organizations. In addition, Orlikowski (1993) showed that computer aided software engineering (CASE) tools produced different degrees of change in adopting organizations. Related studies show how identical technologies experience divergent implementation histories, which may help to account for such contradictions (e.g., Robey and Rodriguez-Diaz 1989; Sahay and Robey 1995). Studies of this type undermine the notion of technological imperative by showing contradictory outcomes where uniform effects might have been expected.

Studies in which contradictory consequences result from the same technology in a single organization. A third group of studies show contradictory consequences of the same technology implemented in the same organization. In several studies different roles are affected differently. For example, Buchanan and

Boddy's (1983) study of a Scottish biscuit plant showed that computerization of the production process upgraded the requisite skills of some operative employees while it simultaneously downgraded the skills of others. While this result should not be surprising, it is contrary to the generalized expectation inherent in the "deskilling" hypothesis (Attewell and Rule 1984). Outside of a production environment, Orlikowski and Gash (1994) observed the occurrence of divergent interpretations of Lotus Notes by managers and technologists in a single firm. Differences in interpretation affected the implementation and consequent use of the technology.

More compelling demonstrations of contradictory results from the same technology identify paradoxes and ironies in the use of technology. Markus (1984), for example, described the implementation and consequences of a centralized financial reporting system within a decentralized corporation. Bjørn-Andersen, Eason and Robey (1986) observed the simultaneous routinization and increased complexity in managerial tasks as a result of computer introduction. Zuboff reported a case where "open" electronic communication networks were endowed with structures and controls that removed their threat to the traditional hierarchy. Orlikowski (1991) noted the irony in the use of CASE tools by systems consultants who were closely controlled in their own use of information technology while creating purportedly innovative solutions for their clients. In each of these studies information technology was associated with consequences that were inherently contradictory.

6. WIDENING THE LENS: EXPLAINING CONTRADICTIONS WITHIN STUDIES

Contradictions within studies pose a different challenge than contradictions among studies. Methodological improvements in research can help to reduce the incidence of such contradictory findings, but they are not likely to eliminate their occurrence. Indeed, some of the "tightest" studies, in terms of research design, measurement, and statistical analysis, have produced the most direct evidence of inconsistent, paradoxical and ironic consequences of technology (e.g., Barley 1986; Burkhardt 1994; Burkhardt and Brass 1990; Eveland and Bikson 1988; Franz, Robey and Koebitz 1986). The source of contradictions, therefore, does not lie exclusively in the methodological weaknesses of existing research.

The most promising recourse for dealing with contradictory findings within studies is the modification of theory. The underlying assumption here is that orderly consequences, as predicted by simpler theories, do not in fact occur. Understanding, therefore, requires the selection of theories that are capable of explaining observed contradictions.

Past reviews have been helpful in widening the lens through which information technology in organizations may be under-

stood. Kling's analysis of the variety of theoretical perspectives applied to research on the social aspects of computing is especially insightful. Kling distinguished between "system rationalist" perspectives, which assume that information technology is an objective tool with largely beneficial outcomes, and "segmented institutionalist" perspectives, which regard information technology's social consequences as basically indeterminate and open to social and political interpretation. Within these perspectives lie a total of six approaches that make somewhat finer distinctions in their basic assumptions. The value of exposing the range of possible alternatives is to reveal the differences among them and to open up possibilities for researchers wishing to employ alternative approaches.

Hirschheim (1985; 1986) has focused on epistemological and ontological assumptions that are associated with fundamental differences in research methods undergirding research. Positivist inquiry is oriented to the discovery of regular, empirical associations among observable objects, namely information systems and organizations. Interpretive inquiry posits that objective reality can only be studied through the subjective meanings ascribed to it by human actors. Interpretive and positivist research are quite different and perhaps irreconcilable. Nonetheless, alternative research strategies may shed different lights on aspects of the same research issue and be useful in accounting for contradictory findings (Orlikowski and Baroudi 1991).

It has also been suggested that researchers reexamine the fundamental structure of theories employed to examine the organizational consequences of information technology (Markus and Robey 1988). Theoretical structure includes consideration of causal agency assumptions and logical structure. Markus and Robey and others (George and King 1991; Hirschheim 1986; Slack 1984) contend that much research employs very simple, "imperative" causal assumptions. Markus and Robey suggested that researchers relax the usual deterministic causal assumptions involving technology and social systems and assume that technology's consequences are "emergent." That is, effects are not entirely distinct from causes, and technology and organizations may mutually affect each other. Markus and Robey also drew attention to the choice between using theory to explain variance and using theory to explain the outcomes of events that occur in time. The latter strategy shifts the research strategy away from adding new variables to one's research model and toward specifying the historical context and social processes from which technical and social change may emerge (Swanson 1987).

Overlooked in most of the suggestions for widening the range of theoretical alternatives is the need to use theories capable of explaining directly the types of contradictions discussed earlier in this paper. In the next section of this paper, limited glimpses at four specific theories with such capabilities are provided. While space limitations prevent a full exposition for each

theoretical approach (scores of books and articles are available on each), the manner in which contradictions are addressed and their application to the issue of information technology and organizational change are presented.

6. FOUR THEORIES THAT EXPLAIN CONTRADICTION

6.1 Political Theory

Political theory uses contradiction as the underlying motivation for social change (Benson 1977). Structural contradictions in organizations refer to the misalignment between contributions and rewards, and such contradictions are viewed as the source of energy from which efforts to transform organizations arise. Oppression of labor, including clerical workers, by managers and capitalists produces opposition in many forms, among which are efforts, both formal and unsanctioned, to transform organizations. Political contradictions are best understood dynamically by viewing currently observable forms of organization as unstable solutions to political struggle. Thus, we should never expect to find political equilibrium, just an ongoing contest between groups, each seeking to promote its own interests.

Political theory also makes clear the value of information as a political and strategic resource. Having intelligence about opponents' activities allows the formulation of more astute political moves. For researchers studying the "effects" of advanced information technologies, political theory directs attention both to the interests of those promoting particular objectives of transformation and to the interests of those opposing it. Managers may embed social controls within applications of information technologies while masking their motives with rhetoric about empowerment and efficiency. Workers may sabotage data entry and modify reports to their own advantage.

At any point in time during the interaction among interested parties, a researcher may detect outcomes from the implementation of information technology that seem paradoxical. For example, the findings of Zuboff 's (1988) and Markus' (1984) research seem only comprehensible when accompanied by the political interpretations provided by the respective authors. Zuboff adopts more of a class-politics perspective than Markus, who adopts an organizational-politics perspective, but both explain observed organizational consequences as temporary outcomes from an essentially political process.

6.2 Organizational Culture

Organizational culture has been a popular approach to understanding organizations since the early 1980s (Smircich 1983). Organizational culture is usually defined as patterns of basic values and assumptions that unconsciously guide the behavior of

organizational members (Schein 1985). Because the basic concept of culture was formulated to explain those aspects of social organization that persist, rather than change, cultural theories help to remind researchers of the difficulty of transforming organizations. Cultural "drag" may be too difficult to overcome even when concerted efforts are made to change culture. Change that is truly "cultural" is admitted incrementally because old assumptions and values tend not to be given up easily.

Martin's (1992; Meyerson and Martin 1987) recent articulation of organizational culture theory from each of three perspectives introduced the idea that cultures may be thought of as fragmented and ambiguous social settings where paradoxes and contradictions thrive. In contrast with the unification and differentiation views of organizational culture, the fragmentation view incorporates paradox as a feature of culture rather than an aberration. Accordingly, contradictions are regarded as a fundamental aspect of culture.

Only recently has organizational culture been suggested as an approach to understanding the organizational consequences of information technology (Robey and Azevedo 1994). Cultural theory regards applications of information technology as artifacts that reflect social values and assumptions. From this theoretical perspective, even the same technologies can acquire diverse meanings depending upon the particular cultural setting in which they are implemented. As a consequence, information technology's social meanings, not technology itself, may be responsible for transforming organizations. Alternatively, social interpretations may prevent even the most ambitious transformation projects from achieving full results.

Organizational culture thus provides explanatory mechanisms for the observed contradictions in empirical literature. Resultant consequences may reflect "partial" transformation, wherein new technologies are implemented and used, but where, for instance, users manifest old assumptions about relative autonomy and control. Contradictions may also be explained as ambiguities that are intrinsic to organizational cultures when viewed through the theoretical lens of cultural fragmentation.

6.3 Institutional Theory

Like organizational culture, institutional theory is generally regarded as a means of explaining why organizational structures and values endure, even in the face of strong reasons and elaborate programs to change them (Scott 1987). Nonetheless, seeds of organizational change are found in institutional theory. Organizations acquire institutional properties by drawing from abstract ideals that a society shares, such as competition, progress, and efficiency. Contradictory structural arrangements may arise where one or more sources of institutionalized values conflict (Meyer and Rowan 1977). For example, U.S. immigration policy seems beset by contradictions due to collisions

between the competing ideals of domestic economic prosperity, cultural diversity, and political refuge. As specific policies are developed and implemented, classes of prospective immigrants find themselves treated differently — some detained indefinitely in offshore camps and others admitted freely.

Institutional theory has informed a small amount of research on information systems, where the ability of systems to take on institutional characteristics has been demonstrated (e.g., Laudon 1985; Kling and Iacono 1989). Institutionalized information systems may resist any attempts to modify them. King et al. (1994) identified a broad range of sources of institutional values impinging upon information systems, including national, cultural and economic influences. In addition, institutional practices within the systems profession have been shown to contain fundamental contradictions (Beath and Orlikowski 1994).

Applied to the question of information technology and organizational change, institutional theory can address contradictions among ideals such as efficiency, rights to privacy and autonomy, and deeply embedded notions of bureaucratic and hierarchical structures. Although systems may be ostensibly designed to advance one of these valued ideals, usually efficiency, they may inadvertently affect others. Resulting organizational forms are likely to reflect such contradictions among competing values. For example, the persistence of occupational status differences within computer conferences that have removed visible symbols of status suggests the durability of our institutionalized notions of social structure, despite the technology's ability to overcome status differentials (Saunders, Robey and Vaverek 1994).

6.4 Organizational Learning

Organizational learning considers organizations to be cognitive entities, capable of reflecting on their own behavior and modifying it. Thus, unlike theories of culture and institutions, organizational learning adopts an active and optimistic posture toward the prospect of organizational change (Fiol and Lyles 1985). Organizational change requires revisions to "organizational memory," which consists of shared understandings about the identity of the organization, shared mental maps relating causes to effects, and stored routines for behavior (Duncan and Weiss 1979; Walsh and Ungson 1991). But changes in these shared understandings are not accomplished by the simple exchange of new knowledge for old, particularly where organizational memory is widely distributed among members. Residual memory may prevent new learning unless there are established norms for experimentation and change. "Learning organizations" pursue such experiments, continuously testing out their assumptions and validating their causal mental maps (Wishart, Elam and Robey in press).

The link between information technology and organizational learning has barely begun to be explored. It is clear that information technologies may support the learning process, as well as provide electronic repositories for certain types of knowledge (Stein and Zwass 1995). Perhaps more significant

is the use of the learning metaphor to complement more radical metaphors like business process reengineering (Robey, Wishart and Rodriguez-Diaz 1995). While learning proceeds from existing memory, reengineering is premised on the ability to obliterate existing processes and to begin anew with "blank slates" (Hammer and Champy 1993). Such an expectation may be inherently contradictory when one acknowledges that existing processes are embedded deeply in organizational memory.

Contradictory outcomes from information technology may be explained in organizational learning theory as evidence of partial learning, cases where parts of existing memory refused to be eradicated despite infusions of information technology. The creation of new, electronically mediated teams, for example, may be mandated, but members may fail to remember what teams they belong to and revert to association with older, informal groups. Organizational learning requires a careful balance between the exploration for new knowledge and the exploitation of existing knowledge (March 1991), and deviations from this balance may result in contradictory outcomes of information technology.

7. CONCLUSION

The theories described above address the common requirement that contradictions be explained, rather than removed. Such theories are likely to be useful in accounting for the observed contradictions in research on the organizational consequences of information technology. Each theory, in its own way, incorporates a "logic of contradiction" by including forces both encouraging and opposing organizational change (Ford and Ford 1994). Each theory sees organizational change as a process in which transformative actions must overcome persistent structures. Information technology can support the processes of either persistence or transformation, or both simultaneously. As intended new structures are greeted by political opposition, cultural and institutional lag, or existing organizational memory, strange new contradictory forms may appear that defy explanation with simpler theories.

All of the theories mentioned above may be housed conveniently within the metatheoretical framework offered by structuration theory. Structuration theory was formulated by Giddens (1984) as a general social theory capable of resolving the artificial separation of action and structure. Structuration incorporates contradiction directly by arguing that action and structure operate as a duality, simultaneously affecting each other (Poole and Van de Ven 1989). Applied to information technology, structuration sheds light on organizational consequences by observing that technologies are human artifacts that affect human action and which constrain and enable such action (Orlikowski 1992; Orlikowski and Robey 1991). Thus, paradoxically perhaps, information technologies are produced by the very social structures that they promise to transform. This reciprocal, mutual causality suggests that information technology should not be treated as an autonomous force affecting social structures. Rather, an understanding of organizational change can only be achieved if the opposing influences of action and structure upon each other are incorporated into explanatory theory, along with information

technology. Theories that incorporate these features offer greater challenges to researchers, but they are also likely to account more satisfactorily for the observed contradictory outcomes of information technology.

Whether conceived at the grand scale of structuration or at the midrange level of specific theories, the search for explanations for observed contradictions is likely to produce more conceptual and methodological diversity. The theories presented here offer little comfort to those seeking to establish significant empirical associations between variables using the methods of normal science. Efforts to encompass contradiction in theory reveal the difficulty and futility of making simple predictions about the organizational consequences of information technology. This does not make them bad theories. Rather, the theories mentioned in this paper seek to fulfill the criterion that good theories explain observed phenomena (Pfeffer 1982). Toward such an end, other conventional criteria for evaluating good theory (notably their falsifiability) may need to be suspended, at least temporarily (Daft and Lewin 1993).

On the basis of this analysis, it is suggested that researchers seek a closer match between theory and observed phenomena. It is reasonably clear that information technology is associated with a wide range of contradictory outcomes in organizations. Our ability to conduct useful research on this important topic is impeded by the use of simplistic theories. This paper offers four candidate theories whose application to research on organizational transformation can potentially contribute valuable understandings of the role of information technology in organizational change.

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