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The Relationship between IT and Organizations: Review of Theoretical Perspectives over Half a Century

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ABSTRACT

Without being exhaustive, this study reviews important theoretical perspectives used by information system (IS) researchers to study the influence of information technology (IT) on organizations and their members in the last five decades. We illustrate these theoretical perspectives by selecting and describing exemplars published in each decade and explain their implications for researchers and practitioners. Our results show that in each of the last five decades, a new theoretical perspective was developed and adopted to extend the previous decade's rhetoric by getting further away from technological determinism in the sixties and closer to more balanced causal arguments explaining the consequences of IT on organizations and their members. Our analysis suggests important implications such as the need for IS researchers to restore theoretical attention to material IT artifacts in IS research and potential approaches that can be used to achieve this goal.

Keywords

Theoretical perspective, rhetoric, information technology, impact, consequence, organization, organizational member, materiality

INTRODUCTION

Since the fifties a persistent rhetoric is that information technology (IT) is typically assumed to be associated with organizational change. IT is often considered as a condition or occasion for change in numerous aspects of organizations and their members such as organizational roles, structures and processes. The tremendous and accelerating advances in IT since the fifties have not decreased practitioners' and researchers' interest in how IT is contributing to organizational change. Over these years, information system (IS) researchers have adopted a variety of theoretical perspectives to understand this phenomenon and offered a progression of explanations to explain it.

The objective of this study is to provide a broad historic overview of important theoretical perspectives that IS researchers have used to study the influence of IT on organizations and their members over the last five decades. In this study, we use the term IT, which has a broad meaning, to refer to a large range of technologies such as communication and collaborative technologies, personal computers, functional and enterprise information systems. Motivating this study is our hypothesis that there have been important shifts in IS theoretical perspectives over this time period. While this review is certainly not exhaustive, identifying and understanding shifts in the theoretical perspectives used by IS researchers over the last fifty years is important to understand past trends and the current state of IS research in this area. These shifts reflect changes not only in rhetorics surrounding IT and organizations but also in the importance of aspects of the reality of using IT in organizations. Moreover, this review highlights some of the different ontological and epistemological positions adopted by IS researchers over time as well as their specific issues and contrasts between them. Finally, this study provides insights into the emergence of new theoretical perspectives and how IS researchers can benefit from their adoption in investigating the influence of IT on organizations and their members.

This paper is structured as follows. First, we describe the research method used for this study. Second, we present the results of this study, classified by separate time periods representing the last five decades. Third, we analyze and discuss these results and provide directions for future research in this area. Finally, this paper ends with a conclusion.

RESEARCH METHOD

Without being exhaustive, this study involved a review of the IS literature looking at the influence of IT on organizations and their members that was published in the last five decades. More specifically, we limited the scope of our literature review by considering only studies published between 1960 and 2010 inclusively and excluding studies focusing on individuals and society. Despite the fact that the normal time to market or delay between the submission and publication of research is about two years, we decided to use the publication dates as the reference for time in our classification of studies. This should be taken into account when interpreting the data.

For each of the last five decades, we first identified important IS studies published and theoretical perspectives used by IS researchers in this area. Then, for each theoretical perspective identified, we illustrated it by selecting and describing exemplars published in the corresponding decade and explained its implications for researchers and practitioners.

RESULTS

This section presents the results of this study, classified by separate time periods representing the last five decades.

1960s

Important Rhetoric for this Period

An important rhetoric for this decade can be referred to as *technological determinism.* As one of the earliest IS research perspective, it adopts a deterministic stance by considering technology (or a specific set of technological features) as an external force, independent of human action, producing significant, inevitable and predictable impacts on organizations and their members (Leonardi and Barley 2008; Markus and Robey 1988; Orlikowski 2010). In this research perspective, technology (or artifacts in general) is seen as an independent variable that would shape organizational life by determining or strongly constraining the behavior of individuals and organizations (Markus and Robey 1988) and through impacts assumed to be fixed and final once the technology is implemented and adopted in organizations (Dutta 2008). Human agents are perceived to be powerless in presence of technology and social outcomes are assumed to emanate from the characteristics of a technology, regardless of users intentions (Markus 2005).

Exemplars

A first exemplar is the study published by Burlingame in 1961 which challenged the deterministic predictions that computers and associated technologies will lead to the elimination of middle managers and the reversal of the trend of the last decade toward decentralization in business. Instead, Burlingame (1961) argues that decentralization and the middle manager are much more likely to grow in importance in the future with the use of computers in organizations.

A second exemplar is the study published by Whisler in 1965 which argues that the flattening of the organization structure is not due to the removal of a whole layer of management as predicted but instead to the redistribution of tasks and responsibilities between organizational roles as the computer took over some parts of various positions. Moreover, Whisler (1965) rejects the deterministic prediction that IT routinizes many of the middle management positions and argues that delegating the computation part to IT will only make the communication part of the manager's job proportionately more important. Although evidence supporting the deterministic prediction that IT recentralizes control and power in organizations was found, Whisler (1965) argues that this is only an interim impact of IT. Whisler (1965) predicts that the creative managerial functions retained by managers will be decentralized while the operating functions executed by IT will be centralized.

Implications for Researchers and Practitioners

The fact that early studies focus on production technologies, seen as mostly fixed, rigid, and not readily adaptable by end users, may have contributed to the adoption of a technological determinism research perspective. Although IT may be seen as having distinctive characteristics and being more adaptable, IT is treated the same way than production technologies: deterministically. Adopting this research perspective means for researchers and practitioners that organizational design is a matter of matching the right organizational structure to the technology used in the organization while moderating the predictable and inevitable impacts of technology on organizations is a matter of stopping, slowing or accelerating the rate of change in technology or selecting technology with specific sets of features (Markus and Robey 1988). However, while the technological determinism perspective has a long history and makes some compelling claims, empirical research has generated contradictory findings on almost every dimension of hypothesized computer impact (Markus and Robey 1988; Robey 1977). Markus and Robey (1988) explain that information systems have been found to both enrich and routinize jobs, both centralize and decentralize authority (Dawson and McLaughlin 1986; Klatzky 1970), and produce unexpected effects (Boudreau and Robey 2005).

1970s

Important Rhetoric for this Period

The discovery of an increasing number of contradictory findings motivates IS researchers in the seventies to adopt a *contingency perspective* that eventually leads to the development of contingency theory. This perspective continues to consider technology as an independent variable but it recognizes the impact of technology on organizational structure as contingent on the fit with other independent variables acting as conditions or contingencies (Markus and Robey 1988). Examples of contingencies are technology, organizational size and level, decision making style, and environmental uncertainty (Markus and Robey 1988). Interestingly, while deterministic accounts of technological impacts are softened by the acknowledgement of various contingencies, a strong commitment to the conception of technology as a material and causal determinant of human action and organizational aspects, independent of humans and organizations, continues to inform the deterministic research perspective (Orlikowski 2010).

Exemplars

A first exemplar is the study published by Jay Galbraith in 1974. According to Galbraith (1974), the greater the task uncertainty (a contingency), the greater the amount of information that must be processed among decision makers during task execution to achieve a given level of performance. Galbraith (1974) develops a framework suggesting organizational interventions for either increasing the organization's capacity to process information or reducing its information processing need generated by task uncertainty. For example, Galbraith (1974) proposes that managers can reduce the need to process information by using rules or programs to coordinate behavior between interdependent routine predictable tasks while they can increase their organization's capacity to process information by investing in vertical information systems.

A second exemplar is the study published by Dan Robey in 1977. Interested in the conflicting findings of many studies conducted during the 1960s and early 1970s about the effects of computer adoption on centralization and decentralization,

Robey (1977) looks at the description of their environmental factors (e.g., competition, regulation) to identify contingencies. Robey (1977) observes that (1) computers do not cause changes in the degree of decentralization, (2) computerized systems are sufficiently flexible to facilitate either centralized or decentralized structures, and (3) the degree of decentralization in these studies is related to task environmental conditions. Robey (1977) finds that in organizations with uncertain environments, IT supports an existing decentralized structure while, in simple environments, IT strengthens a centralized authority structure. Robey (1977) proposes to view IT as a moderating variable, affecting the strength of a causal relationship between environmental uncertainty and organizational structure.

Implications for Researchers and Practitioners

The contingency perspective helps researchers and practitioners to see the impact of technology as contingent on the fit with other variables such as the specific environment of the task or the organization as a whole. Robey (1977) finds that the degree of decentralization is not caused by IT only but also by task environmental uncertainty as IT is moderating the strength of the causal relationship between task environmental uncertainty and organizational structure. Noting that IT is associated with decentralization in uncertain environments, and centralization in certain environments, Robey (1977) proposes to view IT as a sufficiently flexible tool to facilitate either centralized or decentralized structures, thus softening deterministic predictions about the impacts of IT. This vision is consistent with Galbraith's study (1974) which provides a good example of how managers can use IT as a tool in organizational interventions to respond to the organization's information processing needs.

1980s

Important Rhetoric for this Period

In the eighties, the presence of contradictory IT outcomes motivates researchers such as Markus and Robey (1988) to adopt an *emergent process* perspective arguing that uses and consequences of technology emerge from the ongoing, complex and unpredictable interaction of people, technology and context. This perspective views technology as socially defined and produced, grounded in specific historical and cultural contexts and dependent on specific meanings and contingent processes (Orlikowski 2010). Orlikowski (2010) explains that understandings of technology are neither fixed nor universal, but emerge from situated and reciprocal processes of interpreting and interacting with particular artifacts over time. Compared to the deterministic causal arguments of the previous two decades, the emergent process perspective does not acknowledge a dominant cause of change (Markus and Robey 1988). Markus and Robey (1988) explain that a detailed understanding of the dynamic organizational processes and knowledge about the intentions of actors and the features of IT are required to make predictions about the consequences of IT.

Exemplar

An exemplar is the study published by Dawson and McLoughlin in 1986 whose objective is to find whether IT, by providing up-to-date accurate information about local operations to management, erodes the importance of supervision in relation to management control as predicted in the literature. Dawson and McLoughlin (1986) find that IT enables a centralization of overall control at regional and national headquarters while also enhancing the role played by local supervisors by making possible to delegate responsibility for day-to-day decisions from divisional level. Dawson and McLoughlin (1986) explain that although the basis of the supervisor's autonomy prior to computerization is eroded, the overall effect is the integration of supervision into the management control system through the creation of a new supervisory role responsible for local operations.

Implications for Researchers and Practitioners

The emergent process perspective helps researchers and practitioners to recognize the indeterminate nature of the consequences of IT on organizations and their members as these consequences emerge from the ongoing, complex and unpredictable interaction of people, technology and context (Markus and Robey 1988). As a result, some researchers and practitioners adopting an emergent process perspective may eschew intervention, arguing that prediction is impossible and outcomes are indeterminate (Markus and Robey 1988) while others may advocate "emancipatory" strategies, such as extensive user participation in the analysis, design, and implementation of information technology to minimize negative consequences of this emergent process (Markus and Robey 1988).

The study done by Dawson and McLoughlin (1986) helps researchers and practitioners to understand how IT can both enable the decentralization of decisions to supervisory roles and increase the centralization of management control over local operations. As such, these authors demonstrate that the introduction and use of IT in organizations can be seen as an

emergent process through which the precise form of organizational arrangements that might arise from the pursuit of management strategies are, of course, likely to be shaped and mediated by situational factors.

1990s

Important Rhetoric for this Period

An important rhetoric for this decade may be referred to as the *interpretive structurationist* research perspective. Interpretivism is an epistemological position which assumes that knowledge of reality, including the domain of human action, is a subjective social construction by human actors and that our theories concerning reality provide ways of making sense of the world rather than discoveries about an objective world which represent absolute truth (Walsham 1993). Centered on human interpretations and social meaning, interpretive methods of research are aimed at producing an understanding of the context of IS, and the process by which IS influences and is influenced by its context (Walsham 1993). An interpretive structurationist research perspective means also that this perspective is based on Giddens' structuration theory (1984). Structuration theory combines subjective and objective conceptions of organizations simultaneously through its core concept of the duality of structure, conceiving structure and human action as mutually constitutive, each being both constrained and enabled by the other in an indeterminate fashion (Giddens 1984).

Exemplars

A first exemplar is the study published by Orlikowski and Robey in 1991. These two authors highlight the dual nature of IT by showing how IT shapes human action through its provision of structural opportunities and constraints and how IT itself is shaped by human action and prior institutional properties. Orlikowski and Robey (1991) demonstrates also how the use of structuration theory to investigate the relationship between IT and organizations allows IS researchers to overcome several limitations of prior one-sided perspectives.

A second exemplar is the study published by Orlikowski in 1993 which looks at the adoption and use of computer-aided software engineering (CASE) tools over time in two organizations. To make sense of the inconsistent findings in the literature about the outcomes of the use of CASE tools, Orlikowski (1993) proposes to shift the focus away from specific IT outcome expectations to a definition of organizations' experiences with IT in terms of processes of incremental or radical organizational change. Orlikowski (1993) proposes a theoretical framework suggesting that the interaction over time between the intentions and actions of key players around the IT intentions, the change process they enact, and the social context into which IT is implemented, critically influence what organizational changes are associated with the use of IT such as CASE tools.

Implications for Researchers and Practitioners

The study done by Orlikowski and Robey (1991) demonstrates how an interpretive structurationist approach helps researchers and practitioners to account for the mutual and indeterminate influence of structure and human agency, each being able to constrain and enable the other. The study done by Orlikowski (1993) shows to researchers and practitioners the importance of paying attention to human interpretations, context of use and social meaning of IT artifacts. As such, the interpretive structurationist research perspective can be seen as a theoretical solution to overcome the limitations of the deterministic approaches of the 1960s and 1970s while capturing the benefits of the adoption of the emergent process perspective of the 1980s.

2000s

Important Rhetoric for this Period

An important rhetoric for this decade may be referred to as the *human agency* research perspective that gives ontological priority to the role of human agency over the role of social structure and technology as a determinant of the consequences of IT on organizations and their members (Boudreau and Robey 2005). This research perspective is built upon the concepts of human agency and voluntarism, which stipulate that humans can exert some power and free will to influence their environment and the design, interpretation and use of technology to achieve their interests and goals (Leonardi and Barley 2008). Technology is seen as a material artifact that is socially defined and produced, and thus is relevant only in relation to human agents engaging with them (Orlikowski 2010).

Exemplars

A first exemplar is the study published by Orlikowski in 2000 which proposes the adoption of a practice lens to examine how people, as they interact with a technology in their ongoing practices, enact structures called technologies-in-practice which shape their emergent and situated use of that technology. A practice lens recognizes that structures of technology use are not embodied in the technology but constituted recursively as humans regularly interact with certain properties of a technology and thus shape the set of rules and resources that influence their interaction (Orlikowski 2000).

A second exemplar is the study published by Boudreau and Robey in 2005 which investigates the role of human agency in shaping the enactments of an integrated enterprise information system, assumed to constrain human action, in a large government agency. The study's empirical results show that despite the organizational change agenda related to the conversion to the new system, users initially choose to avoid using it as much as possible and then this initial inertia is overcome over time through the social influence exercised by a variety of stakeholders (Boudreau and Robey 2005). As such, the two authors highlight the dynamic nature of technology enactment, supporting a temporal view of human agency (Emirbayer and Mische 1998), and demonstrate how social influence from other people can produce changes in enactments of technology use over time, going from inertia to reinvention of the technology.

Implications for Researchers and Practitioners

Instead of focusing only on technologies themselves and their embodied structures, the *human agency* perspective motivates researchers and practitioners to pay more attention to the role of human agents in their interactions with technology. A large emphasis on the role of human agents can be found in the practice lens proposed by Orlikowski (2000) to explain how emergent structures called technologies-in-practice are enacted in practice and in the study done by Boudreau and Robey (2005) in which they show how human agents can shape the enactments of technology, going from inertia to reinvention of the technology. Boudreau and Robey (2005) demonstrate that even when IT represents a "hard" constraint on human agency, human agents have still residual power to resist it and reinvent it in use.

ANALYSIS AND DISCUSSION

The analysis of the study's results suggests the existence of important shifts over the last fifty years in the theoretical perspectives adopted by IS researchers to study the relationship between IT and organizations. In each of the last five decades, a new theoretical perspective was developed and adopted to extend the previous decade's rhetoric by getting even further away from technological determinism in the sixties and closer to more balanced causal arguments to explain the consequences of IT on organizations and their members. The contingency perspective developed in the seventies somewhat softens the deterministic predictions about technological impacts proposed by the technological determinism perspective by making these impacts contingent on the fit with other independent variables acting as contingencies (Markus and Robey 1988). By acknowledging no dominant cause of change and highlighting the indeterminate nature of the consequences resulting from the use of IT (Markus and Robey 1988), the emergent process perspective developed in the eighties can be seen as a theoretical solution to overcome the limitations of the deterministic approaches of the 1960s and 1970s. The interpretive structurationist perspective developed in the nineties can be seen as a theoretical solution to better capture the benefits of the emergent process perspective developed in the eighties by providing researchers with additional concepts and mechanisms to better understand the ongoing, complex and unpredictable interaction of people, technology and context. Finally, the human agency perspective developed in the 2000s can be seen as a theoretical solution to help researchers to understand conflicting IT outcomes by focusing on the capacity of human agents (Boudreau and Robey 2005) to influence their environment and the design, interpretation and use of technology to achieve their interests and goals (Leonardi and Barley 2008), even in the presence of strong constraints. The analysis of these results suggests also important implications for future research which are now described.

Important Implications Drawn for Future Research

By defining technology primarily in terms of types of manufacturing hardware, material aspects of technology were at the core of early research on the relationship between technology and organizations (Orlikowski 2010). The technological determinism perspective takes into account the material agency of technology by considering technology as an external force, independent of human action. Then, the concept of technology was expanded beyond production environments by making it more abstract so that it can also be applied to the processes and knowledge used in offices and service organizations. Technology started to be described in terms of the characteristics of tasks (e.g., complexity or predictability) that were seen to be proxies for technology (Orlikowski 2010). The increasing abstraction of the concept of technology over time may have contributed to favor human agency in theory and to see IT as almost indefinitely malleable and interpretively flexible.

However, this development of theory is seen by a growing number of scholars as difficult to justify as it somewhat neglects the influence of the distinctive and material aspects of IT artifacts. Orlikowski (2010) argues that while this increasing abstraction of the concept of technology over time allowed for greater research generalizability, by making it applicable to more types of technology and organizational settings, it has unfortunately led to the neglect of the distinctive and material aspects of technologies. Researchers such as Hutchby (2001) react against the treatment of IT as "text" that could be interpreted and manipulated in any way, and others like Volkoff, Strong and Elmes (2007) suggest that material aspects of technology do matter as they can both constrain and enable human action. If IS researchers assume that material properties of IT matter in some ways, then there is a need to theorize those properties in relationship to voluntaristic human behavior, which we already know can make a difference (Leonardi and Barley 2008).

Two approaches can be used by IS researchers to restore theoretical attention to material IT artifacts in IS research. First, IS researchers can study materiality of IT artifacts through the use of other conceptualizations of technology, such as the concept of sociomateriality. According to a performative perspective of sociomateriality, technologies have no inherent properties, boundaries or meanings, but are bound up with the specific material-discursive practices that constitute certain phenomena (Orlikowski 2010). Since such material-discursive practices enact specific local resolutions to ontological questions of the nature of phenomena, researchers need to look at the ongoing and dynamic 'agential cuts' that perform and stabilize/destabilize particular distinctions, boundaries and properties within phenomena in practice (Orlikowski 2010). IS researchers can also study the influence of the distinctive and material aspects of IT artifacts on the design and performance of organizational practice. This suggestion seems especially relevant and promising as an increasing number of organizational tasks are performed through the use of IT artifacts involved in multiple interdependent organizational processes. Second, IS researchers can extend existing theories by incorporating concepts representing the distinctive and material aspects of IT artifacts. While these approaches are likely to generate novel insights about the relationship between IT and organizations, researchers are likely to face new challenges such as defining and operationalizing relational concepts based on the relationship between material IT artifacts and human users, distinguishing between material aspects of IT artifacts that enable human action and those that constrain it, and theorizing about the concept of material agency.

This study, in its current form, has important limitations. They can serve as suggestions of further analysis to improve this study. Identifying important theoretical research perspectives, mapping them to specific time periods and identifying exemplars to illustrate them are all subjective activities. A more complete and balanced review of theoretical perspectives can be achieved, for example, by considering competing and opposing theoretical perspectives and adopting a compare and contrast presentation of the study's findings. Another suggestion is to consider the environment as a whole and explain how it contributed to the emergence of the theoretical perspectives identified. This study can also be augmented by doing a parallel analysis of the evolution of information technologies over the same time period as the concept of IT meant different things over time. These improvements will make this study more balanced in its arguments while providing better evidence to support and augment its claims. Future research can also investigate other aspects of the relationship between IT and organizations.

CONCLUSION

Without being exhaustive, this study provided an overview of important theoretical perspectives that IS researchers have used to study the influence of IT on organizations and their members in the last five decades. We illustrated them by selecting and describing exemplars published in each of the last five decades and explained their implications for researchers and practitioners. The results of this study showed that in each decade, a new theoretical perspective was developed and adopted to extend the previous decade's rhetoric by getting even further away from technological determinism in the sixties and closer to more balanced causal arguments explaining the consequences of IT on organizations and their members. The analysis of the study's results suggested also important implications for future research such as the need for IS researchers to restore theoretical attention to material IT artifacts in IS research and potential approaches to achieve this goal. Acknowledging the study's current limitations, we proposed ways to make the review of theoretical perspectives more complete and balanced. Finally, although we proposed the need for IS researchers to restore theoretical attention to material IT artifacts in IS research, we should not reproduce history by favoring materiality over human agency and adopting a deterministic stance.

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