
Information Technology and the Structuring of Organizations

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Recent work in social theory departs from prior traditions in proposing that social phenomena can be understood as comprising both subjective and objective elements. We apply this premise of duality to understanding the relationship between information technology and organizations. We construct a theoretical framework in which the development and deployment of information technology in organizations is a social phenomenon, and in which the organizational consequences of technology are products of both material and social dimensions. The framework is based on Giddens' theory of structuration, and it allows us to progress beyond several of the false dichotomies (subjective vs objective, socially constructed vs material, macro vs micro, and qualitative vs quantitative) that persist in investigations of the interaction between organizations and information technology. The framework can be used to guide studies in two main areas of information systems research—systems development and the organizational consequences of using information technology.

Information systems—Organizational change—Organizational structure—Social theory—Structuration

1. Introduction

The organizational context surrounding the development and use of information technology continues to attract the attention of numerous researchers and practitioners. The isolation of "implementation" and "organizational impacts" as major factors in the intellectual structure of the information systems discipline attests to the importance of these research areas (Culnan 1986, 1987). Nonetheless, these areas have been criticized for their failure to accumulate consistent research findings and for their neglect in using or building coherent theoretical frameworks (Attewell and Rule 1984, Markus and Robey 1988). Researchers often approach the subject from the viewpoint of an applied problem, such as user acceptance of information systems or the avoidance of resistance by users, and their ensuing research frequently pays little attention to underlying theory about organizations. As a result, researchers have

not produced cumulative knowledge of value to either practitioners or other researchers.

Not all of these criticisms, however, should be absorbed solely by researchers in the field of information systems. The reference discipline for much of this work, organization theory, is beset by extensive debates over fundamental ontological and epistemological issues (Burrell and Morgan 1979). Recent texts (e.g., Grandori 1987, Hartman 1988, Morgan 1986, Perrow 1986, Pfeffer 1982, Scott 1987, Van de Ven and Joyce 1981) reveal a diversity of perspectives in active use that differ radically in their assumptions about the causes of structure, the importance of human intentions and action, the role of environmental factors, and so on. Attempts to integrate these diverse theories, or even to sort out their differences and similarities have not proven wholly satisfactory. This state of affairs thus poses difficulties for any student of complex organizations, not just those interested in information systems.

Our focus in this paper is the theoretical basis of research into the interaction of organizations and information technology.¹ Criticizing research in this arena, Markus and Robey (1988) identified the following shortcomings: inattention to the question of causal agency, over-reliance on variance models in theory, and failure to distinguish among individuals, groups, and organizations as levels of analysis. They recommended adopting emergent rather than deterministic models of causal agency, using the logic of process theory rather than an exclusive dependence on variance formulations, and linking multiple levels of analysis. Despite these recommendations, Markus and Robey fell short of developing a specific theory or framework for guiding more productive research. We undertake that task in this paper.

We first establish the philosophical roots of our perspective which is based on the theory of structuration developed by Anthony Giddens, and which furnishes our basic assumptions about the relationship between structure and action in social systems. We then construct a theoretical framework by building on and extending the central tenets of structuration theory. Our focus in this framework is on information technology, and how information technology is created, used, and becomes institutionalized within organizations. In particular, we posit information technology to be both the product of human action as well as a medium for human action. We conclude the paper with an agenda for research, illustrating how the framework can inform two key areas of information systems research: the organizational process of information systems development and the organizational consequences of information technology.

2. The Nature of Social Reality and the Theory of Structuration

2.1. *Social Reality as Subjective and Objective*

Most social scientists can be broadly classified into two opposing traditions depending on whether their ontological assumptions posit social reality as subjective or as objective (Burrell and Morgan 1979). This opposition is represented by two traditions in the social sciences: the one based on Weber which posits social systems as the result of meaningful human behavior, hence portraying social reality as subjective;

¹ Our usage of information technology is to be interpreted broadly, and we mean it to apply to the use of any computers (that is, hardware and software) deployed within organizations to mediate work tasks. Our only qualification is that the computers are sufficiently general-purpose so as to be capable of modification through systems design and programming.

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the other based on Durkheim which focuses on the institutional aspects of social systems which are seen to be independent of and constraining human action, hence portraying social reality as objective (Bhaskar 1979).

The subjectivist camp includes those who stress the importance of the subjective human experience in the interpretation, creation, and modification of the social world. Theories based on subjectivist assumptions target human actors as their focus of attention. Subjectivist theories attempt to understand phenomena by explaining how knowledgeable individuals create and recreate their social worlds through deliberate action and enactment (see, for example, Weick 1979). Assuming social reality to be objective is a contrasting position that emphasizes the definition of the various elements comprising the objective world, and analyzing the relationships and regularities between these elements. Theories based on such assumptions focus their attention on the institutional properties of social systems. Such objectivist theories attempt to understand phenomena by explaining how institutional properties influence human action and shape social relationships over time.

The controversy in the social sciences has centered on which of these two ontological assumptions, subjective or objective, is the more appropriate for analyzing and understanding social phenomena. This confrontation appears to rest upon the premise that the two positions are mutually exclusive, that theories based on one of these meta-theoretical positions cannot inform theories based on the other. This intellectual schism divides researchers in the sociological, organizational, and information systems disciplines and contributes to the lack of unifying, substantive paradigms in these disciplines (Hirschheim and Klein 1989).

Recent work in social theory (Bernstein 1978, 1983, Giddens 1976, 1979, 1984) and philosophy of science (Bhaskar 1978, 1983) has challenged the enduring opposition of subjective and objective assumptions, and proposes an integrating meta-theory, one that recognizes both subjective and objective dimensions in social reality. In this paper we draw from the work of Anthony Giddens, a British social theorist, who asserted that the premise of mutual exclusiveness between subjectivism and objectivism is untenable. He has developed a theoretical perspective—the theory of structuration—to accommodate the two traditions and hence offers a resolution to the heated debate around which of the two characterizations of social reality has primacy (Giddens 1979, 1982, 1984). In Giddens' view of social reality, both are equally important, and hence both should inform social theorizing and empirical investigation.

Giddens' theory of structuration has been adopted by a number of organizational researchers in their analyses of organizational processes (Barley 1986, Manning 1982, 1989, McPhee 1985, Pettigrew 1985, Poole 1985, Ranson, Hinings and Greenwood 1980, Riley 1983, Roberts and Scapens 1985, Smith 1983, Spybey 1984, Willmott 1987). Despite its growing use in social and organizational theory, structuration has not influenced many researchers exploring the relationships among information technology, human action, and social structure. This is unfortunate because nowhere is the failure to explore ontological assumptions more apparent than in conceptions of information technology by information systems researchers. As a result, information technology has been freely adapted to many theoretical positions held by researchers. This lack of reflection on the nature of information technology assumes it is unproblematic, and renders research vulnerable to the simplifying assumptions of subjectivism and objectivism noted earlier.

2.2. Subjective and Objective Treatments of Information Technology

In information systems research, the *subjectivist* approach to information technology is typified by those assuming a "social action" perspective on information technology. For example, Hirschheim (1986) considers the consequences of office automation to be mediated by the social interpretations offered by users. Prediction of consequences in this view is of limited value; more relevant is obtaining an understanding of the humanistic-interpretive process wherein those engaged with the technology enact various consequences. More mechanistic notions of cause and effect are deemed not useful in the prediction of technological consequences because social situations are not seen as governed by known, or knowable, causal relationships (Hirschheim 1985, p. 250).

While few would argue that office systems can be interpreted in various ways by their users, and that reactions to the same configurations of hardware and software might differ accordingly, the stance assumed by the subjectivists appears to exclude the possibility that systems have any objective characteristics. To this extent, the subjectivist approach seems incomplete. Research on institutionalization (Iacono and Kling 1988) indicates that technology does escape the control of human subjects, becoming formalized, institutionalized, and reified. Further, streams of research on ergonomics (Turner and Karasek 1984, Shneiderman 1980) and medical technology (Barley 1990) indicate clearly that the computer-mediated workplace is not entirely a social construction, and that material characteristics may seriously affect use and alter social relationships.

The *objectivist* approach to technology in information systems research is more common, but not necessarily more accurate. For example, most research on organizational impacts of computing assigns technology the role of independent variable (e.g., Carter 1984) or experimental treatment (e.g., Siegel et al. 1986). By presuming that technology is an object capable of having an impact on social systems, such research treats both technology and organization structures as objects. The metaphor of impact (one object colliding with another) implies objectivist assumptions, and where computers are treated as discrete objects capable of causing impacts, researchers will tend to find such impacts (Kling 1987). The objectivist approach thus overstates the importance of technology's material characteristics and ignores the social interpretations and actions that may modify the impact of particular software systems or hardware configurations.

Rather than perpetuate the intellectual divide between the subjectivists and objectivists who study information technology, we argue for an integration of these positions. We believe that the phenomenon of information technology needs to be examined seriously as part of a more general theory of social structure and action. Giddens' theory of structuration provides the basis for such an integrative theory.

2.3. Integrating Subjective and Objective Assumptions: Giddens' Theory of Structuration

In Giddens' theory of structuration the opposition inherent in the assumption of mutual exclusiveness falls way to an assumption that social reality is constituted by both subjective human actors and by institutional properties. Thus, it is improper to conceive of a social system merely as the product of either deliberate human action or of institutional forces. Giddens proposes what he calls the *duality of structure*, which refers to the notion that the structure or institutional properties of social systems are

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created by human action, and then serve to shape future human action. So human action can be seen on the one hand to constitute the institutional properties of social systems, yet on the other hand it can be seen to be constituted by institutional properties. As Roberts and Scapens (1985, p. 446) note: "Through being drawn on by people, structures shape and pattern (i.e., structure) interaction. However, only through interaction are structures themselves reproduced. This is the 'duality of structure'; it is in this way that structures can be seen to be both the medium and the outcome of interaction." Explanations of social phenomena must thus refer to both the role of human action and the effects of existing institutional properties.

In Giddens' theory, structure is understood to be an abstract property of social systems. Structure is not something concrete, situated in time and space, and it lacks material characteristics. Structure cannot exist apart from the human actors who enact and interpret its dimensions. Structure has only virtual existence.² Interestingly, people readily allow their actions to be constrained by these shared abstractions of social structure. As studies in social psychology amply testify, behavior can be strongly (and sometimes tragically) induced even by vague simulations of authority relationships and other organizational settings.³ The ability of organizational structures to elicit compliance and conformity in the absence of material constraints attests to the power of those socially constructed abstractions.

Giddens (1976, pp. 118-119) offers a useful analogy to clarify the nature of social structures. He notes that structure is like language, an abstract property of a community of speakers, that is sustained through use by human actors in speech. While speech acts are situated temporally and contextually and always involve dialogue between humans, language exists outside of space and time. Language is a condition for the achievement of dialogue, and language is sustained through the ongoing production of speech acts (Giddens 1976, p. 127). So too, social actions are situated temporally and contextually, and they always involve interaction between humans. Social structure conditions these social practices by providing the contextual rules and resources that allow human actors to make sense of their own acts and those of other people.

It is thus more appropriate to speak of social systems as *exhibiting* structural properties that are produced and reproduced through the interaction of human actors, rather than as *having* structures. But individuals do not enact structures in a vacuum; they call on the structural properties that were enacted in the past by prior human action (their own or that of others). In this way, the structural properties established by prior human action come to define and shape individuals' interaction, which in turn recreates the structural properties anew.

Conceiving of structure in this way acknowledges both its subjective and objective features. Structure does not merely emerge out of subjective human action; it is also objective because it provides the conditions for human action to occur. Structure thereby provides the means for its own sustenance, and structure and action constitute each other recursively. To put it simply, structuration theory recognizes that

² Just as in computers, *virtual storage* does not physically exist; however it does exist "in action," through the execution of a given set of software procedures.

³ The obedience studies of Milgram (1974) and the prison guard studies of Zimbardo (Zimbardo and Ebbeson 1969) offer experimental support for this observation. In the field setting, Leiberman's (1965) research on organizational roles is supportive.

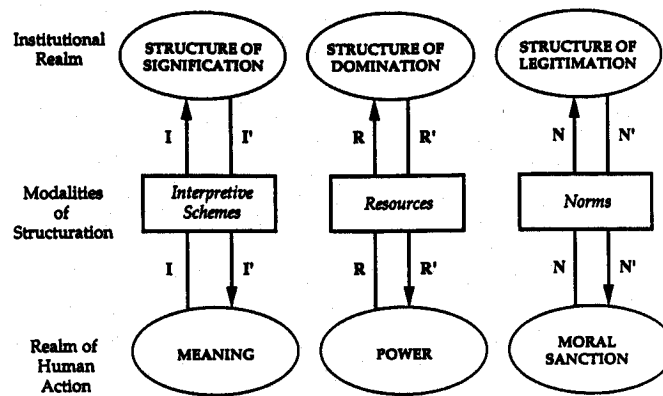


FIGURE 1. The Interaction of Human Action and Institutional Properties as Mediated by the Three Modalities of Structuration (Adapted from Giddens 1984).

“ . . . man actively shapes the world he lives in at the same time as it shapes him” (Giddens 1982, p. 21). This dialectical interplay between the subjective and objective dimensions of the social world eliminates the need to choose a side in the intellectual debate dividing the subjectivists and the objectivists.

Structuration theory also allows elimination of the artificial partitioning of research attention between macro and micro levels of analysis, because the process of structuration operates at multiple levels of analysis: individual, group, and social system (organization and society). By demonstrating how individual action and interaction constitute shared definitions of social structure, Giddens transcends the “unit of analysis” problem identified by Pfeffer (1982), Rousseau (1985), and others. Rather than requiring analysis at either the individual or organizational level (see James et al. 1988, Glick 1988), structuration provides concepts for effectively bridging levels of analysis, thus constructing a more complete social theory (Hartman 1988, Markus and Robey 1988).

2.4. Modalities of Structuration

Giddens goes beyond the observation that the realms of social action and social structure coexist. He specifies that all human interaction is inextricably composed of structures of meaning, power, and moral frameworks, and that any interaction can be analyzed in terms of them. He specifies three “modalities” that link the realm of action and the realm of social structure: interpretive schemes, resources, and norms. These are illustrated in Figure 1. *Interpretive schemes* are standardized, shared stocks of knowledge that humans draw on to interpret behavior and events, hence achieving meaningful interaction. *Resources* are the means through which intentions are realized, goals are accomplished, and power is exercised. *Norms* are the rules governing sanctioned or appropriate conduct, and they define the legitimacy of interaction within a setting’s moral order. These three modalities determine how the institutional properties of social systems mediate deliberate human action and how human action constitutes social structure. The linkage between the realms of social structure and human action is referred to as the “process of structuration” (Giddens 1979). Giddens (1984) describes how these modalities operate within each of the institutional and action realms of organizations, hence achieving an interaction of subjective and objective elements.

The arrows in Figure 1 indicate the recursive nature of structuration, with the

active I (interpretive schemes), R (resources), and N (norms) being balanced by the mediating I' (interpretive schemes), R' (resources), and N' (norms), respectively. The figure represents Giddens' idea that the constitution of social structure through human action and the mediation of human action by social structure occur simultaneously. However, for purposes of explanation, we discuss each of the six arrows separately below.

Interpretive Schemes. From the subjective point of view, human interaction involves the communication of meaning, and this is achieved via interpretive schemes (I), which are stocks of knowledge that humans draw on in the production and reproduction of interaction. Interpretive schemes “. . . form the core of mutual knowledge whereby an accountable universe of meaning is sustained through and in processes of interaction” (Giddens 1979, p. 83). The interpretive schemes, however, do more than merely enable shared meanings and hence mediate communication. Interpretive schemes also serve as conduits for the imposition of structural constraints (I'). From an institutional point of view, interpretive schemes comprise structures of signification which represent the social rules that enable, inform, and inhibit the communication process. Thus in any interaction, shared knowledge is not merely background but an integral part of the communicative encounter, in part organizing it, and in part being shaped by the interaction itself.

Resources. From the subjective perspective, power enters into human interaction by providing organizational capabilities for humans to accomplish outcomes. Power is here understood as transformative capacity, that is, the power of human action to transform the social and material world (Roberts and Scapens 1985, p. 449). Its use in organizations is mediated via the organizational resources (R) that participants mobilize within interaction (Giddens 1979, pp. 92–93). While these resources comprise the media through which power is exercised, from an institutional view resources are structural elements that constitute organizational structures of domination. All social systems are marked by an asymmetry of resources, and the existing structure of domination is reaffirmed through the use of resources (R'). It is only when the existing asymmetry of resources is explicitly challenged or countered, that the existing structure of domination may be modified.

Norms. From a subjective perspective, norms are organizational rules or conventions governing legitimate or appropriate conduct. Codes for legitimate conduct are created out of the continuous use of sanctions by individuals as they interact. “Normative components of interaction always center upon relations between the rights and obligations expected of those participating in a range of interaction contexts” (Giddens 1984, p. 30). Norms (N) thus play an active role in the shaping of institutional notions of legitimate behavior. Simultaneously, human action is guided by cultural notions of legitimacy, as reflected in these norms (N'). From an institutional view, therefore, norms articulate and sustain established structures of legitimation. They reinforce the normative order through tradition, rituals, and practices of socialization.

Typically the role of structural properties in shaping human action and interaction is transparent to human actors. Actors often believe they act freely within organizations, and hence structural properties remain unacknowledged as the conditions of their action. Whether individuals are conscious of the influence of these properties or

not, their action is not possible without the interpretive schemes, resources, and norms they use to realize their intentions. Likewise, the reinforcement or transformation of structural properties by humans is often unacknowledged and unintentional. Structural changes are often attributed to designers' intentions when in fact a large number of unplanned interactions may be responsible for alterations in structure.⁴ In Figure 1, the *I*, *R*, and *N* arrows do not assume conscious intention any more than the *I'*, *R'*, and *N'* arrows assume awareness of institutional influence.

Even when actors are conscious of constraints and aware of potential changes, Heydebrand (1986, p. 5) has pointed out that transformative social practices are not common in organizations: "The notion that social actors are—or become—knowledgeable does not completely address the fact that many actors, even though knowledgeable, fail to change the structural conditions that determine or oppress them, and as a result, simply go on to reproduce these very conditions." Merely being capable of changing structural properties does not imply that those capabilities will be exercised, and while human actors always have some capacity for independent action, there are no guarantees that such resources will be drawn on.

As much prior literature in information systems has shown, information technology provides a particularly interesting and possibly unprecedented opportunity for the redistribution of knowledge, resources, and conventions in organizations, and hence for a shift in the relative capacities individuals have for strategic human action. Given this potential, technology would seem to be an important ingredient within structuration theory. As presented by Giddens (1976, 1979, 1984), the theory of structuration does not explicitly incorporate technology. However, structuration has been used by organization theorists to address the longstanding question of technology's relationship to organization structure. We review these treatments below.

2.5. *The Role of Technology in the Theory of Structuration*

Ranson, Hinings and Greenwood (1980) regard technology as one of several contextual constraints that warrant some form of organizational reaction. Thus, organizational size, production technology, and resources are considered as organizational characteristics impinging on structural choices in much the same way as the environment of the organization affects structure. They propose that ". . . a major change in situational exigencies such as size, technology, and environment will constrain organizational members to adapt their structural arrangements" (1980, p. 13). Unfortunately, this observation offers little more than does standard contingency theory, and ignores two possibilities, namely, that context may play an active role in structuration, and that technology, in particular, can facilitate as well as constrain social action.

Barley (1986) applies structuration theory to the question of technology's effect on organization structure. He describes how diagnostic technology (a CT scanner) served as an occasion for changes in organizational structure through shifts in the interactions of radiologists and technicians working in hospitals. Barley argues that ". . . since technologies exist as objects in the realm of action, one cannot hope to understand a technology's implications for structuring without investigating how the

⁴ Pfeffer (1982) criticizes the rational actor perspective adopted by organizational researchers for its naive assumptions about intention. Structuration theory honors human intention but also respects unintended outcomes far more than the rational actor perspective does.

technology is incorporated into the everyday life of an organization's members" (1986, p. 81). He thus treats technology as a social object, with fixed material features, but indeterminate social implications. Technology is not regarded as causing or even constraining structure. Rather, technology is an "occasion" for structuring because its presence provokes human interactions that may subsequently effect revised social structures.⁵

While we are in fundamental agreement with Barley on this point, we believe that it is also important to understand how technology is physically shaped by the everyday actions of the users and social settings within which it is developed and used. In the case of CT scanning technology, direct users clearly have little control over its form and functioning (although its invention and design is the product of some social context). Perhaps the traditional focus of organization theory on production technologies has masked the possibilities for conceiving of technology in more dynamic terms. In the case of information technology, systems developers and users may exercise considerable influence over the nature of information technology. Users often continually shape and reshape applications, so that technology ceases to be a fixed, tangible constraint.

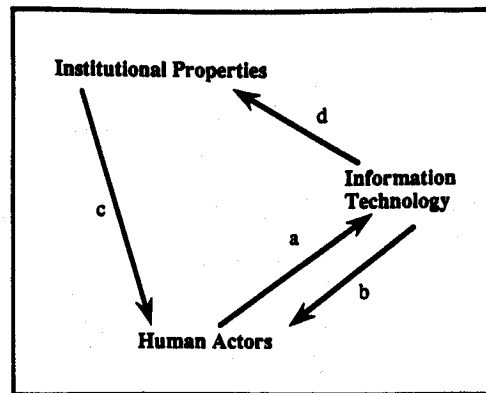
From our observations it appears that technology in general, and information technology in particular, has not been adequately accommodated within the structuration theory. We posit however, that technology—particularly where it is used to mediate organizational processes—will be centrally implicated in the processes of structuration (Orlikowski forthcoming). In the following section, we will examine the implications of such an assertion, and present a theoretical framework which extends the ideas of structuration to include the interaction of technology.

3. Structuration and Information Technology

To overcome the limitations in prior work on technology in the structuration process, we propose a perspective that positions information technology centrally within the process of structuration. In drawing on structuration theory to understand the relationship between organizations and information technology, we acknowledge the underlying duality of information technology. This duality is expressed in its *constituted* nature—information technology is the social product of subjective human action within specific structural and cultural contexts—and its *constitutive* role—information technology is simultaneously an objective set of rules and resources involved in mediating (facilitating and constraining) human action and hence contributing to the creation, recreation, and transformation of these contexts. Information technology is both an antecedent and a consequence of organizational action.

In presenting our framework below, we are considering information technology as it is deployed within organizations to accomplish some task. The focus in our discussion is thus on the organizationally sanctioned development and use of technology. This is primarily an expositional choice—we believe it is easier to grasp the concepts through the use of standard examples. However, we do not mean to exclude from consideration the development or use of technology which is unsanctioned, or which

⁵ Although not explicitly adopting a structurational perspective, Barley's (1990) further analysis of his data nicely demonstrates the interplay of human action and social structure suggested by structuration theory. Barley shows how roles and social networks are influenced by changes in technology and how these, in turn, influence an organization's structure.



KEY:

Arrow	Type of Influence	Nature of Influence
a	Information Technology as a Product of Human Action	Information Technology is an outcome of such human action as design and development, appropriation, and modification
b	Information Technology as a Medium of Human Action	Information Technology facilitates and constrains human action through the provision of interpretive schemes, facilities, and norms
c	Conditions of Interaction with Information Technology	Institutional Properties influence humans in their interaction with information technology, such as, intentions, design standards, professional norms, state of the art in materials and knowledge, and available resources (time, money, skills)
d	Consequences of Interaction with Information Technology	Interaction with information technology influences the institutional properties of an organization, through reinforcing or transforming the systems of signification, domination, and legitimation

FIGURE 2. Structurational Model of Information Technology (Adapted from Orlikowski forthcoming).

runs counter to established conventions. In fact, these events are central to the processes of structuration for they represent occasions for organizational change, where the actions facilitated by the different technology may, over time, institute a new way of doing things and a new sensibility about what technology is appropriate. A number of such examples are presented in §4.

We begin the more formal articulation of the theoretical framework with a proposal for integrating information technology explicitly into the structurational perspective. We then discuss how information technology is implicated in each of the three modalities of structuration proposed by Giddens. Finally, we incorporate into this perspective the contexts within which information technology is developed and used.

3.1. A Structurational Model of Information Technology

Figure 2 depicts a more general structurational model of technology developed by Orlikowski (forthcoming) and applied to the particular case of information technology. This model recognizes four key influences that operate continuously and simultaneously in the interaction between technology and organizations: (i) information technology is the outcome of human action, being developed and used by humans

(*arrow a in Figure 2*); (ii) information technology is also the means of other human action, serving to facilitate the accomplishment of computer-mediated work or communication (*arrow b in Figure 2*); (iii) information technology is built and used within particular social contexts (*arrow c in Figure 2*); and (iv) interaction with information technology influences the social contexts within which it is built and used (*arrow d in Figure 2*). We now explore each of these four relationships in greater detail.

First, **information technology is the product of human action** (*arrow a in Figure 2*), an outcome of agency that can be understood in two ways, that information technology is created and maintained by humans, and that information technology has to be used by humans to have any effect. The first idea reflects an understanding of information technology as a human artifact, that it is built within certain social and historical circumstances. Information technology is designed and constructed, directly or indirectly, by humans (systems developers, users, hackers, etc.), and hence only comes into existence through creative human action. As a consequence of such human involvement in the creation of technology, the technology will tend to reflect the assumptions and objectives of its designers and engineers (Perrow 1983, Winograd and Flores 1986). Further, the utilization of information technology is only preserved through the ongoing maintenance and adaptation of technology by humans (e.g., servicing the hardware, correcting or modifying the software). Information technology is also a product of human action because it has to be used to accomplish some productive task. Even though information technology may be constructed and maintained by certain human actors (programmers or technical specialists) it remains largely ineffectual in facilitating substantive organizational action, unless it is taken advantage of—directly or indirectly—by users. It is only through the activation or appropriation of information technology (Poole and DeSanctis 1989)—physically or socially—by humans in performance of their tasks, that it comes to play a meaningful role in organizational processes.

Second, **information technology is the medium of human action** (*arrow b in Figure 2*) because information technology, when deployed and used in organizations by workers and managers, mediates their activities. By this we mean both that information technology enables or facilitates activities (as in access to a database enabling customer service personnel to respond quickly and intelligently to customer queries), and that it constrains activities (as when customer service personnel lose the contextual customer information that used to be included in the margins of paper-based customer files, and that is no longer available in the electronic records (Kraut, Koch and Dumais 1988)). While this relationship resembles that posited by research into the “impacts of technology,” the structurational version is significantly different in two ways. One is that in the structurational model, information technology does not *determine* social practices. For information technology to be utilized, it has to be appropriated by humans, and in this exercise of human agency there is always the possibility that humans may choose not to use the technology or use it in ways that undermine its “normal” operation. Thus technology can only condition, and never determine social practices. The other difference reflects the dual aspects of mediation referred to above, that technology both facilitates and constrains. In facilitating the execution of a task in a certain way, information technology inevitably must inhibit its execution in some other way. For example, work on the restrictiveness of decision support systems (Silver 1990) illustrates this effect. The dual influence of technology,

however, has typically not been recognized in studies that attempt to determine whether technology has "positive" or whether it has "negative" effects (Attewell and Rule 1984, Hartmann et al. 1986). The structurational model allows us to realize that information technology necessarily has both restricting and enabling implications.

The third central influence in the structurational model of technology is referred to as **conditions of information technology interaction** (*arrow c in Figure 2*). When interacting with information technology (whether designing, modifying, appropriating, or even resisting it), human actors are influenced by the institutional properties of their situation. People do not work in a vacuum; they are constantly influenced by the values, interests, expertise, power, culture, and so on, that surround them. To act meaningfully in organizations, individuals draw on existing stocks of knowledge, resources, and norms to perform their work, often doing so only implicitly. Feldman's (1989) work on policy analysts, for example, documents and explores how individuals engaged in similar work draw on shared meanings, experiences, and collective knowledge. Likewise, when individuals interact with information technology, they utilize the existing stocks of knowledge, resources, and norms that constitute their organization's structures of signification, domination, and legitimation.

The final influence involves the **consequences of information technology interaction** (*arrow d in Figure 2*). When human actors utilize information technology, they act upon the institutional structure of an organization either by sustaining it (more typically) or by changing it (less frequently). As was seen above, the construction and use of information technology is conditioned by organizational stocks of knowledge, resources, and norms which constitute an organization's systems of signification, domination, and legitimation. Invoking structures of signification, domination, and legitimation creates opportunities to either reinforce those structures (through users conforming, often unwittingly, to information technology's embedded rules and assumptions), or to undermine and even transform the institutional structures (through users appropriating information technology in ways that deviate from its sanctioned usage).

These four relationships between information technology and organizational dimensions that constitute the structurational model of technology operate simultaneously, not sequentially. The model integrates the micro and macro levels of social analysis by demonstrating the relationship between human agency and institutional properties. Examining selected relationships (e.g., studying how information technology influences users, without understanding how users appropriate the information technology, or the conditions within which the mediation occurs) can only result in a partial understanding of how information technology interacts with organizations.

3.2. *Information Technology and the Modalities of Structuration*

Giddens' modalities of structuration, discussed earlier, explain the links between the subjective and objective dimensions of social reality. Information technology impinges on each of the arrows in Figure 1 and thereby constitutes a central part in the structuration process. For each modality the aspects of human agency and social structure that it relates to are identified.

Information Technology and Interpretive Schemes. Information technology, by providing a means of representing reality through its set of concepts and symbols, provides a set of interpretive schemes (*I* in Figure 1) through which users come to structure and understand their world. Information technology is a medium for the

construction of social reality. Information technology also institutionalizes those interpretive schemes—those stocks of knowledge—by formalizing and encoding them, making them standardized, shared and taken for granted. Information technology contributes to the signification order by objectifying and reifying human actors' knowledge and assumptions, reinforcing them over time (*I'*).

For example, software can be seen as an interpretive scheme for translating human action into routines. The proceduralized organizational practices that constitute knowledge of the domain being supported, such as accounting, investment banking or airline reservation, are encoded in the technology. Modifications to software, whether initiated by managers or software "engineers", recreate structures of meaning that alter users' world views, priorities, and protocols for interacting (Roberts and Scapens 1985, p. 448). As such, software technology conditions certain social practices, and through its use the meanings embodied in the technology are themselves reinforced or changed over time (Roberts and Scapens 1985, p. 448).

Information Technology and Resources. Information is a resource that can be drawn upon in the execution of work and the making of decisions. Information technology, by formalizing information processing in organizations, is the resource that enables human actors to accomplish their information processing activities. Thus, the design and deployment of information technology, with its implications for information resources and enforcing rules, constitutes a system of domination (*R*). That is, the pattern of resource allocations reinforces an institutional order of authority that creates a differential distribution of power throughout the organization. As an increasingly important resource in organizations, information technology may spawn power struggles because it represents a significant arena for organizational conflict, challenge, and change (Orlikowski 1988).

To illustrate, consider the role of a decision maker who has access to a decision-support tool and a wealth of data about competitors. Such a decision maker will have greater power than other decision-makers in the organization,⁶ because he/she has more knowledge and influence due to his/her access to the decision making tools and associated information. Information has long been recognized as an important source of power (Pfeffer 1981), and information technology in facilitating differential access to information institutionalizes a structure of domination. Information technology, through the particular data model and procedures embedded in the software, also creates a structure of domination by imposing certain ways of seeing and thinking that influence the action of individuals (Boland 1979).

Information technology reinforces systems of domination by institutionalizing the premises for making decisions in organizations. Thus, resources are allocated on the basis of established patterns (*R'*). The decision-support system in the example above would most likely reinforce the political positions of top managers or others holding power. Indeed, research on implementation of computer technology typically shows that existing structures of domination are reinforced (Bjørn-Andersen, Eason and Robey 1986, Kraemer and Danziger 1984).

Information Technology and Norms. Information technology enables the formalization of sanctions and the creation of an institutionalized moral order. By assisting in the codification of norms (*N*), information technology helps to control behavior.

⁶ Assuming that knowledge is valued in this organization, and more particularly that knowledge about competitors is useful in decision making.

Whether through computerized monitoring of routine work (Grant 1988) or through the design of financial accounting controls (Roberts and Scapens 1985), technology tends to ensure that human actors act in conventional ways. While organizations often have conflicting goals and ideologies, the technology will tend to reflect those goals and ideologies of the coalition that built and deployed it. Such information technology will embody the shared meanings, values and goals of that coalition by internalizing and reinforcing the dominant ideology and culture of the organization. In this way information technology can be seen to convey a set of norms (N') that indicate the accepted actions, interests and practices in the workplace. The norms embodied in information technology constitute a moral order, a system of legitimation that directs action and thinking along prescribed paths, and encourages appropriate responses, shared meanings, and common interaction protocols.

In applying technology to organizational tasks, the rules, assumptions, and values embedded in the technology act as a moral imperative, comprising elements in an organization's system of legitimation. By implementing technology to support or automate a task, the organization indicates that the technology is an appropriate means for executing the task and that using the technology is the approved mode of action in the workplace. The routines embodied within the information technology further incorporate certain norms about the appropriate criteria and priorities to be applied to tasks, and the certain manner in which the tasks are to be executed. The very deployment of technology in an organization, therefore, represents a normative sanction.

The modalities of structuration do not operate in a vacuum, but are embedded within historical and organizational contexts. These contexts influence how technology is developed, deployed, used, and institutionalized, and need to be understood within the structuration framework.

3.3. *Information Technology and Contexts of Use*

To this point, our discussion has demonstrated a central role for information technology in the process of structuration. But it is essential to consider the social context and social processes surrounding the use of technology and this can be accomplished within the structuration framework. On the one hand, these social processes are performed by actors (managers, systems developers and users) who develop or use rules and deploy resources to achieve their goals. As an example, organizational actors decide to develop information systems, set up project teams, allocate resources (time, budget and personnel), conduct analysis, design and implementation, and use and modify systems. Each of these deliberate actions is possible only because of the institutional properties of the organization at the actors' disposal, namely shared perceptions of information requirements, steering committees, hierarchical system of control, and norms for developers' relations with users.

On the other hand, social processes surrounding information technology also operate at the institutional level. As an example, the interaction of users and systems developers can be seen to rely on a shared system of signification that provides the common vocabulary through which the activities of both groups are coordinated and assessed.⁷ Further, the authorization of the project team and the allocation of re-

⁷ In fact, breakdowns in this arena—where systems developers and users do not share a common set of concepts and assumptions—are a primary contributor to systems implementation failures.

sources to it draw on and reproduce the system of domination, through which managers have the authority to requisition projects, appoint team members, and deploy resources. Likewise, systems developers have the authority (on the basis of their expertise and experience) to dictate the features of the information system and the execution of development work. Nonetheless, there are opportunities for human actors to modify the existing structure of domination. For example, if users get very involved in a project, they could usurp the systems developers' authority, and start to play a central role in tailoring the system to meet their interests.

Consider also how structures of legitimation support the normative regulation of interaction. For example, subordinates through their compliance to managerial directives behave as systems developers and users, hence reinforcing the deployment of information technology as a solution to organizational problems. Their compliance also confirms the division of labor between systems developers and users, and effectively legitimizes the existing normative order. If, however, users challenge the sanctioned roles of technical experts in systems development, they may undermine the credibility of the existing orthodoxy and establish new norms for interaction between users and developers, such as the establishment of user-led systems development. Users may also create new norms for interaction among themselves when they choose to use a technology in ways that were not intended, as for example, when users employ electronic mail in an uninhibited manner (Sproull and Kiesler 1986) or as an unofficial gripe forum (Culnan and Markus 1987).

In the operation of structuration, there is thus a tension between the knowledgeable action of human actors and the conservative, structural force of institutionalized practices. This dialectic is played out each day in every human interaction, and hence every context of interaction is punctuated by a certain indeterminacy. This indeterminacy, a characteristic of process theories of social phenomena (Mohr 1982), implies that human action in organizations is never totally predictable (because it is never totally determined), and it is never totally random (because it is never totally unconstrained). For the case of information technology, this indeterminacy means that information technology will not always be used in ways envisioned by designers or intended by implementors. Information technology does not simply determine behavior, but is actively invoked and appropriated by human actors. Social practices surrounding the development and use of information technology will therefore result in both intended and unintended consequences, and depend on anticipated and unanticipated conditions.

In brief, we believe that our interpretation of structuration theory offers a meta-theoretic framework for understanding the social factors pertaining to the development, use, and implications of information technology in organizations. Specifically, our structuration framework guides attention towards five issues:

- (i) the development of technology, and how the organizational contexts in which this development occurs shape the knowledge, capabilities, and norms embedded in the technology;
- (ii) the process through which a developed technology is deployed, objectified, and institutionalized within organizations;
- (iii) the intended and unintended consequences of implementing a given technology;

(iv) the conditions within which human action reinforces or changes the form and functioning of an institutionalized technology;

(v) the conditions within which technology-mediated human interactions will sustain or undermine the organizational status quo (that is, when will the development or use of information systems reproduce the structures of meaning, power, and legitimation embedded in a technology and its contexts of use, and when will they transform these structures through dissenting or innovative human action).

These issues can be addressed through a program of research on the systems development process and on the consequences of information system use. While these areas of research interest have in the past been treated separately, the structuration framework presented in this paper allows them to be considered jointly. In the following section we will examine these two research foci, and interpret them in terms of our structuration framework, illustrating the value of an integrating perspective for information systems research efforts.

4. A Research Agenda

The theoretical framework developed here can be used to inform empirical investigations of information technology in organizations. Specifically, the framework helps to organize and orient work in two familiar and central themes within information systems research: the process of systems development and the social consequences of information technology. We consider each of these areas of research separately before suggesting how they might be treated jointly in research. For each item on our research agenda, exemplary studies are provided that indicate the character of such work, even though the investigators may not have explicitly drawn from structuration theory. This is not problematic because structuration is both valuable for interpreting completed research and a useful guide to new research.

4.1. *Research on the Systems Development Process*

The realms of social structure and action may be considered separately for research purposes. For each realm, research may focus on any or all of three modalities. For purposes of the present discussion, we give examples of potential work in each realm, without careful distinction among the different modalities. Table 1 summarizes six areas of potential investigation on the systems development process, using the format of Figure 1 presented earlier.

4.1.1. *The Realm of Social Structure in the Systems Development Process.* The process of systems development is realized through the roles human actors assume in creating information technology. In examining the activities of systems development, the structuration framework alerts us to the institutional context that sustains these roles. Systems developers do not act in a vacuum, but are influenced by factors such as their current state of knowledge, the resources available to them, the objectives of their managers, and the organizational form and culture (see top half of Table 1). Research into systems development can focus on how systems developers and participating users draw on their organization's institutionalized structures of signification, domination, and legitimation to do their work. This examination would investigate the institutional aspects of systems development, by analyzing the interpretive schemes, resources, and norms of the systems development organization, and attempting to understand how these facilitate or constrain the activities of systems developers and users.

TABLE 1
 Framework for Investigating the Interaction of Human Actors and Social Structure during
 Information Systems Development

Realm of Social Structure	Systems Developers are informed by systems development methodologies and knowledge about their organization to build information systems	Systems Developers work within the constraints of time, budget, hardware, software, and authority to build information systems	Systems Developers draw on the values and conventions of their organization, occupation, and training to build information systems
Modalities	<i>Interpretive Schemes</i>	<i>Resources</i>	<i>Norms</i>
Realm of Human Action	System Developers create meaning by programming assumptions and knowledge into the information systems	System Developers build information systems through the organizational power or capabilities they wield in their organizational roles	System Developers create sanctions by designing and programming legitimate options and conventions into the information systems

For example, systems development methodology can be seen both to enable the design and construction of an information system (through providing knowledge, resources, and norms about tasks, models, procedures, and criteria), and to inhibit such development (through imposing a certain world view and set of assumptions on the problem). In drawing on an organization's interpretive schemes, resources, and norms to construct information systems, developers are bestowing legitimacy, validity, and relevance to those schemes, resources and norms, thus reaffirming the organization's institutional systems of signification, domination, and legitimation.

Orlikowski's (1988) research illustrates the way in which structured methodologies constrain system outcomes via standardized interpretive schemes, allocation of resources, and implicit social norms. The study employed ethnographic techniques within a large, multinational software consulting firm that had invested heavily in Computer-Aided Software Engineering (CASE) technology, aimed at automating and supporting the production work of its systems developers. The research study focused in part on the way that CASE technology structured the conduct of systems development work.

Orlikowski reported that CASE users treated their tools as taken-for-granted, external objects. This objectified reality was constantly reinforced as the developers used the tools daily to mediate their development work. Over time, as developers used the tools more extensively, the tools became entrenched as the legitimate way of performing work in the firm. Once institutionalized, the tools were transmitted to new developers, thus bequeathing CASE wisdom to the next generation. Use of the tools facilitated development work, improving productivity in selected stages of the development life cycle, increasing interchangeability of developers, allowing sharing of project information among team members, increasing consistency in output, and assisting coordination of work among the team members. However, they also constrained development work, limiting the extent and nature of developer autonomy, restricting the developers' design vocabulary to concepts "known" to the tools, and enforcing use of the tools' standards, common macros, and generic modules.

Orlikowski concluded that CASE tools contributed to: (i) the firm's structure of signification, because the knowledge embedded in the tools directed the manner in which client problems were interpreted and systems development work was conducted; (ii) the firm's structure of domination, because they constituted a valued source of power, manipulation of which brought credibility, status, and authority; and (iii) the firm's structure of legitimation, because they sanctioned a particular mode of developing systems and propagated a set of norms about professional consulting practice.

4.1.2. *The Realm of Action in the Systems Development Process.* Two possibilities exist in considering research within the realm of action. First, action taken during systems development leads to the production of information technology configured as an information system. Thus, information systems are the product of social action. Research that focuses on the process used by development workers to create designs could draw from the structuration framework to focus specifically on the interpretive schemes, resources, and norms used by developers to constitute new information systems (see bottom half of Table 1). For example, systems developers may constitute new systems by drawing upon new tools, languages, and methodologies as they are developed (e.g., fourth generation languages). Little research on systems development methodologies focuses consciously on the modalities used in the constitution of new technologies. As a consequence, we know fairly little about the way in which action produces information systems, and the topic remains essentially unexplored (Turner 1987).

The second possibility for investigation within the action realm of systems development includes the actions taken by various actors to restructure the roles involved in systems development work. Assuming some prior structure for accomplishing systems development (e.g., the standard organizational roles of analyst and user, the established division of labor on projects, and the standard life cycle approach), roles and relationships can be changed to redefine the organizational structure for constructing information systems. These revised structures may then guide the detailed activities of parties engaged in design work.

In contrast to the lack of research conducted on the structuring of information technology, there have been several studies detailing the actions taken to reconstitute the roles related to development work. For example, Franz and Robey (1984) documented the political process whereby users gained control over the development of a large system in an insurance company. While the researchers tended to focus on issues of power and resources and the hierarchy's sanctioning of "user-led design," they also reported an instance of displacement of an interpretive scheme. In the case, the data processing department produced a 100-page manual outlining a methodology for all systems development at the company. This attempt to disseminate traditional meanings about design activities was disregarded by the user, who offered his own account of design procedures. This contest over meaning served as symbolic backdrop for the more noticeable maneuvering for resources to support user-led design.

4.2. *Research on the Social Consequences of Information Technology*

Like systems development, the social implications of information technology have occupied considerable research attention over the past 30 years. Table 2 summarizes six additional areas of investigation for the area of social implications of information systems, again using the format of Figure 1.

TABLE 2
 Framework for Investigating the Interaction of Human Actors and Social Structure during Information Systems Use

Realm of Social Structure	Using information systems, users draw on embedded knowledge, assumptions, and rules, and through such use reaffirm the organization's structure of signification	Using information systems, users work within the rules and capabilities built into them, and through such use reinforce the organization's structure of domination	Using information systems, users work within the authorized options, values, and sanctions built into them, and through such use sustain the organization's structure of legitimation
Modalities	<i>Interpretive Schemes</i>	<i>Resources</i>	<i>Norms</i>
Realm of Human Action	Users appropriate the rules, knowledge, and assumptions embedded in information systems to perform tasks, or they may modify their patterns of use to create new structures of meaning that potentially alter institutionalized practices	Users appropriate the rules and capabilities embedded within information systems to achieve authorized outcomes, or they may modify their patterns of use to create new structures of domination that potentially alter institutionalized practices	Users appropriate the legitimate conventions of use within information systems to execute sanctioned action, or they may modify their patterns of use to create new structures of legitimation that potentially alter institutionalized practices

4.2.1. *Realm of Social Structure and Social Consequences of Information Technology.* In studying the implications of information technology we are more concerned with how information technology is implemented, assimilated, and adopted by users, and what the consequences of such usage are. That is, we are interested in information technology as a medium of human action. The structuration framework again allows us to recognize a number of different interactions. The structural perspective focuses on how human action is shaped by use of information technology. As noted above, when a technology is deployed in the workplace it tends to assume an objectified rigidity that appears deterministic, that is, technology is perceived as an institutional property. Through the interpretive schemes, resources, and norms embedded in a technology, the users' behavior in utilizing the technology will be mediated (see top half of Table 2). In serving as a medium of human action, information technology (by embodying certain institutionalized properties) shapes that action. And it shapes action by facilitating certain outcomes and constraining others.

For example, Grant (1988) conducted a study of the implications of computerized performance monitoring systems on clerical workers in 51 Canadian firms in a variety of service industries. She was able to differentiate four dimensions of monitoring systems: extent of monitoring, measurement frequency, recipients of performance data, and objects of measurement. These characteristics affected the perceived importance of service workers' production and their interactions with clients, supporting the general thesis that information technology can affect work life. Significantly, monitors were not seen to replace human supervisors, but their presence altered supervisory responsibilities toward controlling more qualitative aspects of work. Fur-

ther, Grant's data refuted the common wisdom that monitors necessarily reduced the perceived importance of workers' interaction with clients.

In explaining these results, it is apparent that interpretive schemes play an important part in mediating the effects of the technology on the workers and the workplace. Grant indicated that employees seemed to judge the appropriateness of the computer for measuring their performance. They did not accept computers as automated versions of manual controls. The "credibility" of monitors assumed primary importance in producing consequences, according to Grant, and credibility was inevitably a matter of interpretation. Grant recommended an ongoing dialogue involving managers and workers to ensure that computerized measures are regarded as appropriate.

Power and norms are also important modalities accounting for technology's consequences in organizations. In particular, Kling's (1980) review indicated the extent to which social analyses of computing have been informed by political theory and other "segmented-institutionalist" approaches. Clearly, any research agenda on social implications of information systems should consider the roles that resources play in explaining changes in work settings. As users work within the rules and capabilities provided to them via their information technology, they reinforce the structures of signification and domination and sustain the organization as a legitimate social order. The interpretive schemes operating in conjunction with resource distributions and norms reinforce such institutionalized patterns of use.

4.2.2. Realm of Action and Social Consequences of Information Technology. Focusing on the structural properties of information systems alone fails to acknowledge the degree to which information technology plays a role in organizational change or transformation. While some claim that radically different organizational forms are possible with information technology (Applegate et al. 1988, Zuboff 1988), such claims remain items on our research agenda, to be substantiated empirically rather than accepted as *faits accomplis*. To inform research within the realm of action, one again may turn to the modalities of interpretive schemes, resources, and norms that comprise the general model of structuration. Structural organizational change is possible through human action, where such action leads to revisions of shared meanings and norms, shifts in roles, resources, and power, and modifications in forms of control and authority (see bottom half of Table 2).

The dilemma in attempting organizational change is that such action may directly conflict with established patterns. As in §4.1.2, deviations from established patterns require disruptions that may be unacceptable to those that regulate symbols, resources, and authority. Consequently, organizational changes may occur gradually, through incremental patterns of use or nonuse of designed system features. For example, users may decide to modify the way in which they integrate the technology in their work, ignoring some "required" features and manually overriding others. Over time, these modifications may themselves become institutionalized and sanctioned as proper patterns of use. In other cases, change may be the product of deliberate strategy or open dialogue conducted by steering committees and other policy groups.

Research illustrating the action realm is scarce, but Kling and Iacono (1984) conducted a case study wherein the pattern of organizational control changed in response to a new material requirements planning (MRP) system. By broadening the directions of flows of information in the company, the MRP system altered the traditional vertical pattern of control and introduced what Kling and Iacono term an "institu-

tional" form of social control. Middle managers were more tightly controlled, but not by higher levels of management. Rather, control was occasioned by information flows, specifically the requirements that data for the MRP system be accurate and timely.

Kling and Iacono reported that education about the importance and use of the MRP system was part of a strategy of control consciously imparted by top management. This clearly represents the use of interpretive schemes in changing organizational structure. Further, the tighter coupling of organizational actions through interdependent rules and practices instilled new norms for data handling into all affected departments. Since data were available to all users of the computer-generated reports, it became possible for lateral departments to exert pressure on a "deviant" department (i.e., purchasing) to enforce compliance with data requirements. In this way, institutionalized control became a reality, replacing the older hierarchical controls.

4.3. *Research on the Relationship between Systems Development and Social Consequences*

The research agenda and examples given thus far deal with isolated components of the structuration framework. More integrated attempts might focus simultaneously on systems development and the implications of information system use. Because technology is a social product, designed and constructed through human action, considering the "impacts" of technology without considering its development is incomplete. For political analysts in particular, the consequences of computing use are directly attributable to the lines of purposive action followed by dominant parties (Kling 1980). Technology itself cannot do anything. Therefore, it would be more informative to tie the development and use of technology together into a single, albeit more ambitious research program.

Few researchers have attempted this task, but two studies may be mentioned. First, Markus (1983, 1984) made explicit the link between development and use in her Golden Triangle case. Adopting a political, interactionist perspective, she attributed the consequences of information technology deployment (in this case, the centralization of corporate control) to the actions of participants during the development process. Development was characterized by conflicts over system features, with the central debate aired over the degree of centralization of the database technology. In the end, objections of divisional personnel were overridden by corporate staff in the selection of a centralized corporate database design. The fact that the corporate structure soon mirrored the technical configuration should be no surprise. In Markus' analysis, corporate intentions to centralize were merely expedited by the technical agenda.

In Orlikowski's (1988) research, the development and institutionalization of CASE tools was documented in addition to the patterns of CASE use that we have already discussed. The consulting firm studied was found to have invested in CASE tools to attain specific economic and organizational objectives. Systems development work was historically ill-defined and hard to control. The development of CASE tools had been preceded by the standardization of development methods around a single, comprehensive methodology, which spelled out the assumptions and details of systems development tasks commonly executed in consulting engagements. Thus, the tool developers possessed a highly detailed "cookbook" on the nature of systems develop-

ment work as practiced in the firm. This cookbook provided the rules around which the computer procedures of the CASE tools were constructed.

Two aspects of the context within which systems development practice had developed within the firm are informative in understanding the intentions behind standardizing development methods. First, consultants worked under considerable pressure. Their schedules were extremely tight and left little time for thinking about alternative systems development approaches and little inclination to deviate from the standardized path. Second, deployment of CASE tools allowed the firm to reduce its dependence on skilled technical specialists and to retain less technically-skilled developers. The CASE tools embodied significant amounts of technical knowledge about operating systems, database management systems, programming, and testing. Many developers in the firm thus had little insight into the technical details of the CASE tools, as they did not have the requisite technical expertise or experience to understand them.

As pointed out before, the CASE tools institutionalized the development process in the firm studied, thus enabling as well as constraining future development work. By jointly considering the development and use of the information technology studied, Orlikowski was able to connect the reasons and conditions of CASE tool development to the consequences the tools had in their organizational setting.

5. Conclusions

In this paper we have proposed a dual conception of information technology which highlights important dimensions of the relationship between information technology and organizational life. We have suggested that information technology has both social and material properties: being physically and socially constructed by subjective human action, while also objectified and reified through institutionalization. We drew on the premises of structuration theory to discuss the nature of information technology and its interaction with organizations. We found that structuration theory appears well-suited for the understanding of information technology in organizations, and in particular, that it can provide a significant foundation for substantive information technology theory. Structuration theory fits the class of theory recommended by Markus and Robey (1988) for research into the interaction of information technology and organizations. It is an emergent, process theory which accommodates multiple levels of analyses, is contextually and temporally situated, and avoids the blinders of ahistorical accounts of social phenomena.

Adopting structuration theory to the study of organizations and technology allows us to overcome several limitations of prior one-sided perspectives: (i) The determinism and reification of technology plaguing objectivist theories is tempered by a recognition that organizations exist only through ongoing human action. (ii) The extreme voluntarism advocated by subjectivist theories is restrained by a recognition that organizational properties become institutionalized and assume objective identities beyond easy reach of acting individuals. (iii) The lack of attention paid to contextual and historical factors by much of the objectivist and subjectivist research is redressed by focusing on the context of interaction, and by integrating the action of humans with the ongoing stream of social practices that produce and reproduce social systems over time.

The structuration perspective, by synthesizing objective and subjective elements of social phenomena, also has methodological implications. It allows a blurring of the

sharp divisions between the so-called qualitative and quantitative methodologies of research in the social sciences.⁸ Giddens (1984, p. 330) suggests that much of the conflict between quantitative and qualitative positions in social science research is “. . . a methodological residue of the dualism of structure and action.” By this he means that just as structure and action are typically viewed as separate and incompatible dimensions of social phenomena, so too researchers have assumed that qualitative and quantitative research methodologies are distinct and incompatible. However, in resolving the spurious conceptual dualism of prior research traditions by adopting the duality perspective of structuration theory, we have legitimate grounds to reduce this methodological conflict between qualitative and quantitative research approaches. Studying the process of structuration within an organization requires attending to both human action (which lends itself to study by ethnographic and qualitative fieldwork) and institutional properties (which may be studied via more quantitative methodologies such as survey research or quasi-experimentation). Researchers should also be cognizant of the role of historical and contextual factors in the process of structuration, and accommodate these in their research designs. The implication is that we should encompass a variety of research methodologies within an emergent research strategy, such as provided by a contextualized and longitudinal program of investigation.

This call for research at multiple levels of analysis using a combination of quantitative and qualitative methods carries the risk of greater diversity and perhaps confusion within the academic community of information systems. However, the call is accompanied by a more basic recommendation for an integrative theoretical perspective, that of structuration. The role of theory in information systems is to enable research, not confuse it. Because structuration serves as meta-theory, it does not pre-empt existing theories of social processes involving conflict, learning, growth, and so on. Neither does it replace existing theories of organization with their emphasis on structure, controls, and institutional properties. Rather, structuration theory provides a higher level of synthesis that permits us to see the connection between ongoing human activities, social processes, contexts of use, and enduring social structures.

The structuration framework is not without its limitations (see the discussions in Cohen 1989 and Held and Thompson 1989). While the theory overcomes many of the problematic distinctions at the core of social research, it poses its own set of difficulties (Poole and Van de Ven 1989). A major methodological concern is the difficulty in empirically applying the ideas we have developed here. In particular, the theory provides a meta-theory—a way of thinking about the world—rather than a middle range theory about specific phenomena that can be explored or tested directly and empirically. As Archer (1982, p. 459) notes: “The theory of ‘structuration’ remains fundamentally non-propositional.” Giddens’ concepts have also been subject to some criticism. Callinicos (1985) and Neimark and Tinker (1986) argue that, despite the fact that Giddens recognizes that action and structure are reciprocally related, they are still treated as analytically distinct. In contrast, these critics argue,

⁸ A discussion of the tensions and differences between these methodological streams is beyond the scope of this paper. Interested readers are referred to Chua (1986), Evered and Louis (1981), Morgan (1983), Morgan and Smircich (1980), and Weick (1984). For recent discussions in the information systems literature, consult Kaplan and Duchon (1989), Orlikowski and Baroudi (1991), and Robey et al. (1989).

the social context so deeply influences individuals' perceptions, knowledge, experiences, understandings, choices, priorities, and actions that human agency cannot be seen and understood as separate and distinct from social structure. Archer (1982) questions whether it is possible—once structure and agency are conceptually coupled as they are in Giddens' duality of structure—to separate them analytically for the purpose of theorizing and empirical investigation. Archer (1982, p. 477) notes that as a consequence of coupling agency and structure, it is difficult to simultaneously conceive of human action as chronically reproducing existing social forms on the one hand, and as having transformative capacity on the other hand. It is thus not possible, she believes, to theorize about both variations in voluntarism (how social systems are produced by human action) and determinism (how social structures shape human action).

These criticisms notwithstanding, we believe there is much to be learned from applying the insights of the structuration process to the phenomenon of information technology in organizations. In this paper we have suggested that a structural perspective of information technology can provide a valuable theoretical basis for research into the interaction of information technology and organizations. We have emphasized the dual nature of information technology, which focuses attention on how information technology shapes human action through its provision of structural opportunities and constraints, while also recognizing that information technology is itself the product of human action and prior institutional properties. Although information technology has been neglected in structuration theory, it occupies a central place in information systems research, and we have discussed how the concepts of structuration can guide the efforts of research on both the development and consequences of information technology in organizations.*

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