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1. The Theory Imperative

We are in the midst of a data glut. Nearly two decades ago, in the face of wide-ranging speculations about the effects of new technologies on organizations, we heard the cry for more empirical data (Klemmer, 1973). We have heeded that call, yet our knowledge claims are still very limited. Why? The problem is that the accumulated data lacks a theoretical infrastructure—a tree to which individual findings can be grafted to generate the synthesis and integration needed to support knowledge claims. Even with the best crystal ball, the early framers of organization theory could not have envisioned the new organizational systems and processes that have evolved with the marriage of computers and telecommunications. Consequently, contemporary organization theory is ill-equipped to cope with these changing contexts. And, new theories have not arisen to fill the gap. In short, the field of communication technology in organizations is data rich but theory poor. And, as Blalock (1969, p. 2) notes, any good social scientist knows that the facts do not speak for themselves. Theoretical structures are critical.

Why Theory?

Why is the development of theoretical structures so critical to the study of new information technologies in organizations? First, theory provides a framework for synthesis and integration of empirical findings. Theory can help make sense of the jumble of research findings that have accumulated in the last two decades. Theory can (1) provide road maps as to what patterns to look for in the data, (2) point us toward explanations for the patterns, (3) help to resolve inconsistencies across studies, and (4) help to account for anomalous findings.

Theory also offers guidance as to where to direct *future* empirical attention and provides a structure for incorporating future research findings. Thus, it drives a more efficient and meaningful research effort. Theory also motivates integrated programs of research rather than fragmented individual studies. The overall consequence of theory-driven research efforts is a

In Janet Fulk and Charles Steinfield (eds.),
"Organizations and Communication Technology,"
Sage Publications, Newbury Park, CA, 1990.

more coherent and defensible set of conclusions on which to base knowledge claims.

Second, the capacity of theory to *generate a priori hypotheses* adds an element of rigor to the research effort. It helps avoid the temptation to let the data suggest hypotheses that are then considered supported by those same data—with the resulting risk of false positive findings. These findings then serve as the basis for future studies, with the risk of a misguided research effort. Theory-driven research, of course, is not immune to false positive findings. However, theory makes the fallibility of empirical research much more manageable (Pickering, 1984).

Third, theory helps to focus research on *conclusions designed to be generalizable* across a spectrum of organizations and technologies. Information technology research is particularly vulnerable to generating idiosyncratic findings. Early research on “new” technologies inevitably focuses on exceptional organizations: early adopters and organizations willing to experiment with new technologies. Generalizable conclusions are difficult to draw when the evidence is obtained from outliers. This challenge is compounded when studies take place during the early stages of adoption. Initial periods of instability immediately after technological implementation may bear little resemblance to periods of stability that are achieved after the first year or so of implementation (Johansen, 1976). A well-conceived theory forces us to attend to issues of generalizability of conclusions.

Fourth, theory helps us see the forest as well as the trees. Theory provides perspective on the larger issues and *directs us toward more broadly-based knowledge claims*. Staw (1985, p. 97) notes:

When research is literature- rather than theory-driven, contributions to knowledge are more conservative and incremental than they need to be. Because authors focus more on how their research fits with the previous literature than on the organizational problem itself, their research inevitably becomes directed toward controversies and gaps in the literature rather than toward a fresh look at the issues being studied.

Fifth, the existence of theory regarding the organization/technology interface appropriately *directs our research attention to central issues of organizational functioning* rather than misguided technological imperatives. Most researchers are trained to avoid Type I error (rejecting the null hypothesis when it is true), and Type II error (accepting the null hypothesis when it is

false). Our greatest vulnerability, however, is in making Type III error: testing the wrong hypothesis (Mitroff & Featheringham, 1974). Type III error occurs when researchers have not succeeded in the most critical task of all: adequately representing the scientific problem for investigation. This error is most likely when our research is driven by the technological opportunities themselves, rather than basic issues of organizational communication and behavior. Theory can help guide us to important organizational issues and, it is hoped, steer us away from being enamored with the technology to the point where we are looking in the wrong place to find both questions and answers. Of course, the formulation of theory cannot guarantee that the scientific questions are appropriately posed. However, the process of theory development is likely, in itself, to assist us in preparing well-conceived questions.

Sixth, on a more practical level, theory provides a mechanism for integrating new and emerging fields with other related fields. The importation of theoretical premises from other fields that commonly takes place during the process of theory development sets up conditions for a more integrated social science. It also provides legitimization for young fields of study in relation to more mature disciplines. Contractor and Eisenberg (Chapter 7) note that the editors of the *Handbook of Communication Science* did NOT include a chapter on technological impacts. This occurred despite the editors' contention that the technologies would have considerable impacts, because the emerging field lacked “a unique theoretical focus.” Theory, it seems, provides a key legitimizing function.

The goal of this volume is to provide a foundation for theory development on information technology in organizations. We make no claims to be comprehensive of all organizational processes nor all new communication technologies. Rather, we consciously have been quite selective. The authors who have agreed to contribute to this volume are individuals with considerable accomplishments in the conceptual domain. Their primary similarity is a strong drive for working on and formulating interesting problems. They all share a concern for the challenges facing organizations today as they are literally bombarded by new communication options in the face of considerable competitive pressures. And, they all share our goal of developing the knowledge base on information technology in organizations through the ongoing process of theory development. In short, they are all willing to take the first step in what will inevitably be a long and exciting process of developing a broad base of theories in the longer term.

Where Should Theory Come From?

The approaches to theory development employed in this volume are as diverse as the theories themselves. Most papers apply a variety of logics; a sampling is described below.

In the classic inductive model of theory building, researchers formulate theory based upon patterns of relationships observed in descriptive studies of communication technology uses and impacts. Patterns of uses and impacts are then explained by referring to the unique attributes of the technologies in question. Quite often, this approach is used to study a single new technology medium, such as electronic mail, rather than a range of new media. Much of the new information technology literature has followed this approach (for a good example, see Hiltz [1984] for a review of studies of computer conferencing). This approach, if carried out in isolation from other logics, is most vulnerable to false positive findings. As Popper (1981, pp. 72-73) noted,

the belief that we can start with pure observations alone, without anything in the nature of a theory, is absurd. . . It is quite true that any particular hypothesis we choose will have been preceded by observations—the observations, for example, which it is designed to explain. But these observations, in their turn, presupposed the adoption of a frame of reference: a frame of expectations: a frame of theories. If they were significant, if they created a need for explanation and thus gave rise to the invention of a hypothesis, it was because they could not be explained within the old theoretical framework, the old horizon of expectations.

Popper further suggests that a more productive approach is to acknowledge and articulate the theoretical frame of reference and subject it to critical tests and rules of critical argument. The profitable use of induction in conjunction with deductive rules of argument is illustrated by Markus' theory (Chapter 9). She generates expectations for use of interactive media based on deductions from an application of the Theory of the Critical Mass. She then proceeds to show how the patterns observable across previous research studies converge with the expectations derived from the theory.

A second approach found in previous literature is to conceptually analyze the attributes of new communication technologies, and use the resulting framework as a heuristic guide to develop propositions regarding uses and impacts. Miller and Vallee's (1980) conceptual framework for understanding electronic message systems is a good example of this approach, although they only considered a single type of new communication medium. Nass and

Mason (Chapter 3) engage in such a conceptual analysis but consider a broader base of technologies and explicitly concern themselves with the organization/technology interface. They identify a range of technological and social dimensions that can be used to characterize all information technologies. One particular advantage of their approach is its conceptual breadth. It avoids the trap of being enamored with a particular technology to the point where the technology itself becomes the focus and driving force of the research. It frees the researcher to attend to more fundamental and timeless issues. It also provides a coherent foundation for cross-system and cross-technology comparisons.

A variant of the above strategy is to analyze the capabilities of new technologies along important organizational dimensions identified by previous theory. Then, predictions can be made for the organizational effects of new technologies by drawing on the expectations from theory. Huber's theory (Chapter 11) accomplishes this strategy very robustly. He analyzes the capabilities of new decision technologies and suggests how these capabilities are relevant to concerns within the realm of existing organizational theories. He then employs these theories to develop predictions for the effects of new decision technologies on organizational intelligence and decision making. Interestingly, he finds that current theories generate equally defensible yet contrasting predictions of effects. His piece, in particular, raises important questions about the ability of existing theory to directly confront the complexities of new decision technologies.

A third approach is to apply existing theory to the new context, where "new context" is the organizational setting in which new information technologies are employed. This model of modifying basic theoretical foundations to account for changed contexts is illustrated by the modifications that took place in organizational behavior theory with the influx of substantial numbers of women into the workplace. The revised theories recognized the new contexts for social and organizational relations. Organizational studies as a field is rich with theory. However, virtually all of this theory was developed prior to the very recent developments in computers and communications that are now being incorporated into organizations. Many of the conclusions from currently accepted theory need to be revisited. This process, we believe, will demonstrate that a great deal of existing social and organizational theory, if appropriately modified, is still relevant to the study of new media. Constructive alteration of current theory to new technological contexts offers more benefits than pursuit of either traditional theory or new technology research in a vacuum. Allen and Hauptman's model (Chapter 12) exemplifies this approach. They demonstrate how organizational information processing

theory can be effectively modified to account for new communication options in R&D settings. They argue that the theoretical trade-offs between functional and project goals are not inevitable in the context of new information technologies. Their model explicates how different communication options can substitute to some degree for both functional and project designs. Thus, new communication options make possible simultaneous project and functional designs without resorting to the cumbersome matrix structure. In the same vein, Zmud (Chapter 5) integrates tenets from information systems theory to create a model of strategic managerial information behavior via new information technologies.

Yet a fourth approach relies on reasoning by analogy from other concepts and theories. Historians and philosophers of science have long observed that scientists will frequently seek to understand new phenomena through the use of analogies and that these constitute the source of much innovation in science (Hesse, 1970; Knorr-Cetina, 1981; Pickering, 1980, 1984). By conceptually equating a less-understood with a better-understood phenomenon, scientists mobilize an existing body of knowledge to help deduce expectations for the new situation. Pickering argues that the study of high-energy physics advanced because theorists made an analogic connection between hadrons and nuclei. In the analogy, hadrons (e.g., protons and neutrons) were seen as composites of particles known as quarks, in the same way that nuclei are composites of protons and neutrons, and atoms are composites of nuclei and electrons. In another important instance of analogic theory construction, information theory was introduced into the social sciences from the physical science of thermodynamics (Shannon & Weaver, 1949).

An analogy produces a conceptual interaction between the two objects of comparison. By relating one object to a second, not only is the latter object viewed as similar to the former, but the former becomes more like the latter. In a parallel fashion, when using an existing theory to study information technology, not only do we view information technologies from the perspective of the theory, but we begin to view the theory from the perspective of the attributes of information technologies. Thus a natural consequence of the application of existing theory to the study of information technology is that each informs the other. This synergy may lead to valuable modifications in the original theory as well. Contractor and Eisenberg's model (Chapter 7) exemplifies this recursive process. They demonstrate how an analogy to social interaction theories not only benefits the emerging field of information technology in organizations, but also has implications back to the original social theories.

A number of other chapters in this book also borrow theory originally applied to different situations. In doing so, they provide a rationale for fitting the theory to the study of information technology, that is, they stress the "positive analogy" (Hesse, 1970) and deduce propositions to guide future research efforts.

This approach to theory development is not without its critics (Crane, 1980; Willer, 1967). Buck (1956, p. 225), for example, criticizes the use of analogy in general systems theory on two grounds. First, it goes little further than simply stating structural equivalence—it does not answer the question "so what?" Second, the subject of negative analogy (explicating the areas where the analogy does not fit) "is almost completely neglected by general systems theory." The problems Buck notes, however, lie in the development of that particular theory rather than in the process of employing analogies. What remains for information technology theorists, if we attend to Buck's recommendations, is to explicate the areas of negative analogy, and to specify the neutral analogy (where we do not know if the analogy fits). Hesse (1970) argues that this is the area of the greatest payoff.

Fulk, Schmitz, and Steinfield (Chapter 6) attend to Hesse's counsel. They argue that the dominant theoretical model of media use, the literal application of organizational information processing theory to the context of media choice, has created vast areas of negative analogy—so vast that it is time to search for a theory with a better "fit" to what is known about social and organizational behavior. They propose an alternative analogy using social influence theories, and show how the balance of positive to negative analogy is improved by employing the alternative model. Similarly, Poole and DeSanctis (Chapter 8) draw lessons from an integration of conflict theory and findings from studies of communication technology effects. Their efforts lead to a new theory, the Theory of Adaptive Structuration, which provides insights into not only group process in computer-assisted decision support systems but also to conflict management processes in general.

Analogic processes can be particularly fruitful when they bring to bear the tenets of theory developed in very different contexts. These analogies help us turn the kaleidoscope and reconfigure our notions about organizations and information technology. As Huber (Chapter 11) notes, linkages across fields provide important opportunities for synergy, and also improve the efficiency of social science research. Several of the chapters in this volume fruitfully apply theoretical approaches from such diverse fields as economics (Beniger, Chapter 2), sociology and public policy (Markus, Chapter 9; Thorn & Connolly, Chapter 10), and social psychology (Trevino, Daft, & Lengel, Chapter 4; Fulk et al., Chapter 6).

A fifth and final approach to theory development is to explicate the communication implications of theories that do not provide explicit propositions about communication. These implications link the theory base with the communication capabilities of new information technologies. The connecting tissue demarcates a rich new area for the development of propositions. One useful starting place for this type of exercise is Euske and Roberts (1987). Following the earlier example of Farace, Monge, and Russell (1977), Euske and Roberts examined the implications for organizational communication contained in seven categories of organization theory: classical, human relations, behavioral decision theories, systems theory, resource dependency, population ecology, and institutional. For example, among the implications from resource dependence theory are communication strategies for managing interdependence across firms, for coordinating the formation and maintenance of interorganizational networks, and for acquiring and controlling information as a source of power. Consider an interorganizational network comprised of a large, dominant manufacturer and a host of suppliers. Resource dependence issues are increasingly implicated as their transactions become mediated by new information technology. General Motors, for instance, has a network of many small suppliers of parts and other materials that depend upon GM. GM now requires all suppliers to use electronic data interchange (EDI) in lieu of paper-based business transactions for order entry. However, in the absence of a universal EDI standard, GM requires all of its suppliers to use the GM promoted MAP standard. This further increases suppliers' dependency on GM, as they must invest scarce resources on a specific type of information system that may not permit links with other manufacturers.

The EDI example described above illustrates one of several ways that information technology concepts can be integrated into an existing theory via development of the theory's communication implications. Viewed from a different angle, employment of the new technology appeared to "reinforce" an existing structure of power relationships. An alternative perspective predicts that use of new communication technologies reverses existing structural trends. Thus, with deployment of new information technologies, a highly centralized organization will become more decentralized, and vice versa. (For a review of these two perspectives see Dutton & Kraemer, 1980. Nass & Mason, Chapter 3, also touch on this issue.) As we become more sophisticated in the development of organizational theory that is sensitive to new communication technologies, we can generate more complex conceptualizations than simple reinforcement or reversal approaches.

How Do We Assess Theory?

Increased effort at theory building will require ongoing efforts to evaluate and improve the resulting theory. Certainly the same classic metrics that are used to evaluate any theory pertain to theories of organizations and information technology. Theoretical frameworks must still be judged by their ability to target empirically accessible questions, provide for parsimonious explanations, and maintain internal consistency and logical coherence (Weick, 1987). Additionally, given the critical importance of information technology to organizational functioning, theories must also be judged by their ability to address issues of relevance to practitioners. As Huber (Chapter 11) notes, the newness and volatility of the "new" technologies create a vacuum of applicable managerial experience to guide management of impacts. This means that relevant, valid theory is doubly important.

The role of relevance as a criterion for evaluating organizational theories is stressed by Weick (1987, p. 105), who elaborates upon five properties of relevance developed by Thomas and Tyman (1982). Theories that have *descriptive relevance* address issues and phenomena that practitioners actually encounter. To the extent that outcomes of interest are addressed by theories, they have *goal relevance*. If the causal variables in a theory can in some way be controlled by practitioners, then Weick suggests that theory has *operational validity*. When theories exceed the complexity of common sense knowledge already used by practitioners, they meet the criterion of *non-obviousness*. Finally, Weick notes that *timely* theories are developed soon enough to deal with current problems. As Weick (1987) notes, however, not all good theories are so applied at the outset; many often lack descriptive relevance and timeliness in particular. Yet a theory that does not meet these two criteria might still prove to be relevant once applied to a specific situation. In so doing, the theory may be altered to conform to local conditions, and become both descriptively relevant and timely.

What Do These Theories Imply for the Research Process?

Many authors in this volume take Huber's advice and suggest implications for management practice. For this chapter, we conclude with a brief consideration of several implications of the combined chapters for the practice of research.