INFORMATION TECHNOLOGY IN ORGANIZATIONS: PARADIGMS AND METAPHORS

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ABSTRACT

As new and more advanced computer technologies have become available, the role of Information Technology (IT) in organizations has been changing. The historical analysis of the evolution of IT in organizations helps to identify major technological paradigms. Each of these paradigms can be further associated with a metaphor to describe the predominant use of this technology and its ability to reduce a specific type of uncertainty. One of the major lessons that can be drawn from this analysis is the need to study particular appropriations of IT in organizations, in order to distinguish between successful uses of IT and failed attempts to take advantage of this technology.

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1. INTRODUCTION

Some authors construct and organize reality through paradigms (e.g. Kuhn, 1962; Morgan, 1980; Schumpeter, 1964), through metaphors (e.g. Morgan, 1986; Kendall & Kendall, 1993) and through narratives (e.g. Benbasat, et al. 1987; Bruner, 1986). This paper uses all three to analyze the social construction of Information Technology (IT) in organizations.

Although the concept of paradigm, made popular by Kuhn (1962), has been used in many different ways, this paper uses the notion of *technological paradigms* to describe the evolution of IT in organizations. Specific *metaphors* are then used to illustrate how organizations use or "appropriate" (Giddens, 1979; Poole & DeSanctis, 1990) those paradigms. The significance of each metaphor is further evaluated based on the organization's ability to reduce a particular type of uncertainty. Finally, two different but complementary research propositions are put forth to address the research questions raised by this paper. The first proposition consists of performing a content analysis of the IT literature, in particular journal articles published in the field. The second approach is based on the development of *narratives*, "good stories that are contextually and temporally bound" (Barry & Elmes, 1997: 847), to confirm the existence of these metaphors.

Analyzing the social construction of IT in organizations is a complex endeavor for two reasons: (1) as IT evolves, its social construction changes, and (2) different

organizations use IT in different ways and thus its social construction varies across organizations. Thus, the use of different analytical devices (such as paradigms, metaphors and narratives) is necessary to undertake this study.

2. DEFINING INFORMATION TECHNOLOGY

Traditionally, technology was defined as machinery and hardware (Scarbrough & Corbett, 1992: 3). But most authors (e.g., Flores et al. 1988; Porter & Millar, 1985) seem to agree with Scott (1992: 227) who proposes that "[Technology] includes not only the hardware used in performing work but also the skills and knowledge of the workers, and even the characteristics of the objects on which work is performed".

Technology is more than just machinery. It also encompasses the design of practices and possibilities to be realized through artifacts (Flores, et al. 1988). Technology can be thought of a combination of a physical (or objective) component - the artifact- and an intangible (or subjective) component that refers to the possible uses of the artifact. Technology is a dynamic concept, based on the interplay between artifacts and praxis. Technologies are potential praxis because artifacts are designed to produce specific practices. But praxis are emergent. Therefore, each individual, group or organization may use or appropriate the technology in a different way.

Appropriation is the process whereby a user selects and gives meaning to the features of the technology. It is the mode or fashion in which a structure is used, adapted and reproduced. Users do not passively receive the technology in a preexisting form; rather, they actively adapt the technology to their own ends. Therefore, a technology in use

should be conceived as a set of social practices that emerge and evolve over time (Giddens, 1979; Poole & DeSanctis, 1990). Appropriation processes occur because the interaction between artifacts and practices is not completely determined.

Sometimes, the interplay between designed artifacts and emergent practices does not produce the intended results (Scarbrough & Corbett, 1992). Appropriations are called "stable" when artifacts and structures are used as designers intended (Poole & DeSanctis, 1990). Stable appropriations are built on the notion that the artifacts somehow constraint the praxis. Appropriations can also be "unstable", when technologies are used in ways in which designers never imagined or envisioned. Sometimes, unstable appropriations are desirable. They may be a requisite for learning how to use technology in creative ways (Poole &DeSanctis, 1990).

The possibility of unstable appropriations recognizes that the praxis is not completely determined by the artifact. The relationship between artifacts and praxis is bi-directional, neither has precedence over the other. Artifacts can constraint the possibilities of action, but there is always some room for new actions to emerge over the same designs.

Information Technology (IT) as any other technology can be defined as the interaction between artifacts (hardware, software, and networks) and the practices or possibilities –praxis– to be realized through these artifacts (Flores, et al. 1988). IT users choose what features of the technology they will use, and how they will use those features.

The term Information Technology (IT) was first used by Leavitt and Whisler (1958) to emphasize the role of computers to support decision making and organizational information processing. This term integrates not only the data processing capabilities of the computer, but also the human and managerial abilities involved in their use. As in any

other technology, IT involves not only computers and related artifacts, but also the design of new practices and possibilities for new realms of practice (Flores, et al. 1988).

However, IT is different because of its inherent capacity to *informate* the processes in which it is used, by generating underlying information. IT not only enhances automation by allowing some organizational processes to be performed with more predictability and reliability, but also generates a wealth of information about these automated processes (Zuboff, 1988). The capacity to automate and informate at the same time is what separates IT from any other technology that exists within organizations.

2.1 IT in Organizations

One of the main propositions of organizational theory is that firms process information in order to reduce uncertainty. Traditionally, uncertainty is associated with the lack of information, the difference between the amount of information required and the amount of information already possessed by the organization (Galbraith, 1977). To deal with uncertainty, organizations must collect, gather and process information (Daft & Lengel, 1986; Tushman & Nadler, 1978).

Spender (1993) uses the term *incompleteness*, or ignorance of what can be known, to label the most common interpretation of uncertainty (i.e. absence of information). This type of uncertainty assumes that the information exists somewhere but there is a gap between the information needed and the information already owned. This gap can be reduced if more efforts are devoted to collecting and gathering missing data (Daft & Lengel, 1986; Spender, 1993).

Another type of uncertainty arises when the information is available but its meaning can not be grasped precisely. Spender (1993) used the term *irrelevance*, to refer to situations in which the analyst is unable to comprehend the meaning of the data at hand. To counteract this type of uncertainty, better acquisition methods and more powerful analytic tools must be developed.

These two notions of uncertainty -incompleteness and irrelevance- presume that the necessary information exists and can be obtained, but there is some kind of gap that prevents its complete mastery, a possession gap in the first case, or an understanding gap in the second case. Both concepts presume a knowable reality that can be grasped. However, sometimes the problem is more complex than just acquiring or interpreting existing information. In some cases, the information is simply not available at any cost.

Spender (1993) distinguishes two other types of situations in which uncertainty arises because the world is not completely knowable. The first case is *indeterminacy*, or the presence of unpredictable others whose actions cannot be anticipated. The second case is *incommensurability*, which refers to the limited and fragmented nature of the information.

Indeterminacy arises because of interactive relationships or interdependencies of the organization with other actors in the environment, such as customers, suppliers or competitors. The degree of dependence among them sometimes calls for game theory applications to figure out the possible outcomes of the interaction and to proceed later with a rational optimization. When the game becomes more complex, the best alternative is to "negotiate these interactions under conditions of incomplete knowledge" (Spender, 1993: 19).

Incommensurability refers to the difficulty of (1) comparing different objects "apples and oranges", (2) assembling fragmented data extracted from multiple sources or (3) fitting together different types of information. To deal with this type of uncertainty, leaders and managers are forced to make sense of the reality using their judgment and intuition, and enact their environments (Weick, 1979). This type of uncertainty, more than any other, creates a place for managerial judgment and strategic choice in the analysis (Child, 1972).

Table 1 summarizes the typology of uncertainty developed by Spender (1993).

Table 1: Spender's Typology of Uncertainty

Type of Uncertainty	Definition
Incompleteness	Absence of knowledge or Galbraith's (1977) notion of difference between information at hand and information needed
Irrelevance	Information is available but its meaning can not be understood or analyzed
Indeterminacy	The presence of unpredictable others whose actions cannot be anticipated
Incommensurability	Limited and fragmented nature of the information

The organizational literature recognizes the value of IT because of its potential to reduce or counteract uncertainty. Thus, if different types of uncertainties can be distinguished, does this mean that different types of IT are necessary? The next section addresses this question and analyzes the evolution of IT in organizations.

3. IT PARADIGMS AND METAPHORS

Information Technology (IT) and its applications in organizations have changed dramatically in the last decades. IT has evolved from a strictly supporting role in the back-

office to a competitive weapon in the marketplace (Ives & Learnmonth, 1984; Parsons, 1983; Porter & Millar, 1985) and a new channel for conducting business (El Sawy & Bowles, 1997; Kambil, 1997). The combination of increasing capabilities to process information and the decreasing costs of this technology has resulted in a broader range of computer applications in organizations.

In the 1960s, mainframe computers were introduced in large organizations to take over many operational and routine tasks. Their role was to automate the paperwork, especially in accounting and record-keeping functions. These tasks were previously performed entirely by clerical personnel. In this period, the computer was like a heavy-duty calculator entirely operated by computer professionals.

As the cost and size of computers diminished and their power and capacity increased, many companies and departments installed mini and microcomputers to automate their daily work. Computers progressively assumed some middle management functions, such as decision making, coordination and control. Most of the information users in organizations had computers on their desks and access to the data they needed to carry out their job. These personal computers offered independence from the mainframe but constrained the user with limited memory and processing speed.

Further developments in networks allowed firms to link their own computers with computers outside the organizational boundaries, establishing links to other companies in the environment such as buyers and suppliers. Today, recent advances in communication technologies, in particular the Internet and the World Wide Web, have opened up new possibilities for organizations to influence their environments by linking them directly with

the final consumer of their products or services. Table 2 presents a summary of the evolution of IT in organizations.

Table 2: Evolution of IT in Organizations

Period	IT Artifacts	IT Praxis (Uses and applications)
1060s	Mainframes	Automation of routine and repetitive tasks (accounting and record-keeping functions)
1970s-80s	Minis and Micros	Middle-management functions (decision-making, coordination and control)
80s-90s	Networks	Inter-firm linkages
1990s	Internet and WWW	Direct connection with customers

In the mainframe era, IT was incorporated into the organization to automate clerical and repetitive tasks, to perform the accounting and record keeping functions more efficient and effectively than traditional manual methods (Argyris, 1971). Transaction Processing Systems (TPS) and Management Information Systems (MIS) were aimed at "number-crunching" and providing large quantities of accurate and updated data to managers.

The next generation of applications was focused on Decision Support Systems (Klein & Hirscheim, 1985) and Group Decision Support Systems (Jessup & Valacich, 1993). These systems provided decision-makers with powerful models for analyzing information, and improving decision quality (Flores et al. 1988).

The development of networks made possible the advent of a new type of system - Inter Organizational System (IOS) - aimed at tackling this problem. IOSs are computer-based information systems shared by two or more companies that automate the flow of information among them (Ives & Learmonth, 1984; Scott-Morton, 1991). They enable organizations to communicate more easily and less expensively across time or geographic location, to communicate faster and with more precision to targeted groups, and to keep track of the content and nature of the communication (Hiltz & Turoff, 1993; Huber, 1990).

Recently, the explosive growth of the Internet has allowed many organizations to effectively influence the environments, altering their product or service mix, changing the relationship with outside partners and customers (El Sawy & Bowles, 1997) and modifying the rules of competition in their industry. Through their Web sites, organizations can directly access their final customers, bypassing traditional intermediaries or distribution channels, and collecting a wealth of information about actual and prospective customers (Kambil, 1997). Many organizations are dramatically redefining their traditional environments by using their Web sites on the Internet.

Schumpeter's (1964) argument of different eras dominated by different technologies or "technological paradigms" can be adapted to the realm of IT in organizations. Four different IT-paradigms (hardware and software) can be identified from the above historical analysis. Table 3 summarizes these paradigms.

Table 3: IT-paradigms

Period	IT artifacts (hardware)	IT Applications (software)
1060s	Mainframes	Automation of transactions (TPS) and aggregation of information (MIS)
1970s	Minis and Micros	Models to support decision-making (DSS and GDSS)
1980s	Networks	Links between organizations (Inter-Organizational Systems)
1990s	Internet	Organizational Web sites

3.1 IT Metaphors

Typical uses or "appropriations" of these IT-paradigms can be described through metaphors. Kendall and Kendall (1993) define metaphors as "cognitive lenses" to understand reality and structure thoughts. Morgan (1986) suggests that metaphors should be used as descriptive devices first, and then the significance of the interpretations produced should be evaluated. Consistent with Morgan's (1986) two-step approach, this paper uses different metaphors to highlight IT appropriations, and then, the importance of

each metaphor is evaluated in terms of its contribution to the reduction of uncertainty in organizations.

In the first IT-paradigm, computing was viewed as a ***tool*** or an appliance, "a piece of equipment like a hammer, a drill or a saw, which extended and enhanced the capabilities of a person in a particular task" (Vitalari & Venkatesh, 1987: 65). Tools can be used to get the job done, and someone (users or IT staff) determines what purposes need to be accomplished with what tools (Benbunan-Fich, 1995).

As the technology developed, the computer demonstrated its ability to stand alone, to informate, automate (Zuboff, 1988) and "supervise" production processes. In the second paradigm, IT was more like a ***machine*** because computers were working by themselves, emancipated from human operators, and even replacing many human workers (Benbunan-Fich, 1995). The distinction between tools and machines is based on Ortega y Gasset (1941) argument that the tool is an extension of the user, while the machine exhibits more autonomy of operation.

In the third paradigm, IT was used as a strategic ***weapon*** to gain competitive advantages over actual and potential competitors (Ives & Learmonth, 1984). IT was used to raise entry barriers, or to lock in customers and suppliers, or to change the very nature of the business by introducing new or related products (Parsons, 1983; Porter & Millar, 1985). The weapon metaphor emphasizes that the IT focus was on gaining competitive strength, not on improving the internal operations of the organization (Benbunan-Fich, 1995).

The Internet and the increasing degree of connectivity at all levels of society are amplifying the role of IT from a mere weapon to a brand new ***channel*** to exchange

information and to conduct business. The Internet provides the infrastructure for an electronic marketplace in which buyers and sellers meet and carry out their transactions (Kambil, 1997). The Web can be seen as a distribution channel, a medium for marketing communications and a market in and of itself (Hoffman et al. 1995)

3.2 Significance of the Metaphors

These IT-metaphors can be interpreted as efforts to reduce different types of uncertainty defined by Spender's (1993). In the first IT-paradigm, the computer was used as a repository of information, hoping to alleviate the informational gap produced by incompleteness-type uncertainty (Benbunan-Fich, 1995). The assumption behind TPS and MIS was that the greater the quantity of data and accuracy of information, the better the ability of the managers to make decisions (Flores, et al. 1988). In other words, if the information were available, managers would be able to analyze it. Indeed, these better informed managers began to experience information overload and to discover their own cognitive limits to process information. Then, the managerial problem was no longer data availability but data modeling. To overcome this deficiency, DSS were developed to enhance the managerial abilities to counteract the irrelevance-type uncertainty.

TPS, MIS and DSS shared the positivistic assumption that the reality is knowable, and the need was for more and better tools for grasping it. However, most of the problems faced by organizations are not always due to the lack of data or models but to the impossibility of anticipate the actions and consequences of multiple actors in the same competitive space. The use of Inter-Organizational Systems (IOS) addresses this problem (Benbunan-Fich, 1995).

IOSs span or shift the organizational boundaries to include elements of other organizations, creating "bridges" between an organization and other organizations in its environment (Scott-Morton, 1991). "The typical solution to problems of interdependence and uncertainty involves increasing coordination, which means increasing the mutual control over each other's activities" (Pfeffer & Salancik, 1978: 43). In fact, by reducing the freedom of maneuver of organizational actors, these systems lead organizations to work together, to co-operate, for their mutual benefit. Bridging strategies through IOS may be viewed as a response to increasing organizational interdependence, and consequently as an attempt to reduce the uncertainty produced by many actors interacting in the same space -indeterminacy- (Spender, 1993).

After resolving the indeterminacy level of uncertainty, managers are faced with the challenge of "enacting" their environment. Enactment requires that organizational members not only selectively perceive but also directly influence the state of their environments through their own actions (Weick, 1979). One of the ways in which organizations can enact their environment is appropriately selecting their domains. An organization's domain consists of the claims it makes with respect to products or services provided and populations served. These claims relate the organization to a number of other organizations (suppliers, customers, competitors) that affect its behavior and outcomes (Scott, 1992). Information systems are key to select organizational domains (Scott, 1992) and to define or re-define environments (Lenz and Engledow, 1986). Seeking innovative applications of IT through the use of Web sites and the Internet helps organizations to enact their environments. By doing so, organizations are counteracting the incommensurability dimension of uncertainty.

3.3 Integration

Linking the typology of uncertainty to the previous analysis of IT paradigms and metaphors, some analogies can be drawn. IT as a ***tool*** is used to reduce the informational gap produced by incompleteness-type uncertainty. As a ***machine***, it is used to provide sophisticated analytic tools and techniques to enhance the managerial ability to analyze data, in order to reduce irrelevance-type uncertainty. IT as a ***weapon*** tries to reduce the indeterminacy level of uncertainty and, as a ***channel***, reduces the incommensurability aspect by enacting the environment.

Table 4 presents the paradigms, the typology of uncertainty and the metaphors.

Table 4: IT Paradigms and Metaphors

IT-paradigm	Type of Uncertainty	Organizational Responses	Metaphor
Mainframes & TPS, MIS	Incompleteness	Gather more information	Tool
Minis, Micros & DSS, GDSS	Irrelevance	Development of sophisticated models	Machine
Networks & IOS	Indeterminacy	Bridging strategies	Weapon
Internet & Web-based systems	Incommensurability	"Enactment" of the environment	Channel

Although the paradigms and metaphors may be similar across organizations, the specific practices and implementations of IT are different in each firm, according to the strategy, structure and culture (Benjamin, et al. 1984). When the same computers are found in different companies, their use and meanings may be different from one company to the next. Computer systems can be crucial for the flow of production in one company, a status symbol in another or the hobby of an engineer in a third (Sackmann, 1988). Each firm will appropriate IT in its own and unique way.

IT as any other technology, is embedded in the organization's cultural system, which determines how technological artifacts are constructed and interpreted (Bijker et al. 1987; Ihde, 1993). Since IT is constructed at the organizational and individual level, it may mean different things to different people and to different organizations. Even in firms belonging to the same industry, the same IT paradigms may render very different results. Due to differences in their cultural systems, what appears to be a successful IT application in one firm may be a failing technology in another (Bijker & Law, 1992).

The question is what makes an organization successful in its use of IT? Truly successful IT appropriations are those that radically alter the competitive rules in some industrial sectors. For example, when the ATMs were first introduced in the banking industry, the innovator "constructed" a new reality and changed the competitive environment. Likewise, the developers of the first automated reservation systems in the airline industry changed their environments.

Similar cases are now happening in cyberspace. Several entrepreneurial companies have found a tremendous success for being the first ones to use their Web sites as a vehicle to conduct business. Pioneer companies such as Amazon.com, or greetstreet.com, the electronic greeting card firm, have changed the competitive landscape in their respective industries (Benbunan-Fich, 1999; Kambil, 1997).

The power of successful IT appropriations resides in their ability to modify the industry pattern of managerial beliefs (“industry recipe" in Grinyer & Spender, 1979), which is developed according to the competition and the characteristics of the industry. When new IT applications change the rules of the game, the commonly held "industry recipe" is no longer valid.

This analysis lays the theoretical foundations to explain the use of IT in organizations. As in any other theory-building effort, there is a need for empirical verification. Two fundamental research questions are raised by this study: To what extent firms have actually appropriated the IT-paradigms as described by the metaphors to counteract specific types of uncertainty? And what makes IT a critical technology in one firm and a status symbol in another.

4. RESEARCH PROPOSITIONS

Two research propositions can be used to evaluate the research questions raised by this study. One possible way to test IT-appropriations and the reduction of uncertainty in organizations would be to perform a content analysis of the existing IT literature. The examination of the relevant articles published in the top Information Systems journals in the last decades would help to evaluate if the description of the technology and its uses conforms the claims of Table 4. Other authors have successfully employed this research method to examine different aspects of the Information Systems field (e.g. Alavi & Carlson, 1992; Culnan & Swanson, 1986; Gillenson & Stutz, 1991; Hamilton & Ives, 1982; Walstrom, et al. 1995) Therefore,

Proposition 1: A content analysis of the IT literature regarding concrete applications of IT in organizations will provide evidence of the existence of the IT-paradigms and their appropriation.

To address the second research question, it is necessary to study stories (narratives) of successful and unsuccessful IT appropriations. In fact, some authors (e.g. Courtney, et al. 1983; Hamilton & Ives, 1982) argue that the most commonly employed empirical strategy in Information Systems is the case study method of research, to learn the state of the art and generate theories from practice (Benbasat, et al. 1987). Thus, a compilation of narratives of IT appropriations in organizations over the past decades would help to identify the key elements that determine the success of IT in some organizations.

Narratives derived from case study research would highlight the specific processes by which particular organizations adopt and adapt IT. Hopefully, a collection of narratives will help to identify the crucial factors that contribute to the different social constructions of IT in organizations, and will shed some light to the key elements that help some firms to choose the *right* technologies and radically alter the "industry recipe".

> *Proposition 2: The compilation and analysis of actual narratives of IT in organizations will help to identify the key elements that make IT successful in some organizations.*

Each proposition suggests a specific course of action to address the research questions raise by this study. The first proposition is based on the review of published experimental research in the field. The second proposition is grounded on the case study method of research and consists of compiling and analyzing narratives of IT appropriations in particular organizations.

5. CONCLUSIONS

IT, as any other technology, can be defined as the interplay between artifacts (machinery) and praxis (or practices). Through the analysis of the evolution of IT in organizations, this paper identified different combinations of hardware and software and defined four major IT-paradigms. The practices associated with these paradigms were described using four metaphors, namely: tool, machine, weapon and channel. The importance of each metaphor was evaluated in terms of the ability to reduce uncertainty in organizations.

In fact, the difference between IT and other types of technology is its power to reduce the uncertainty that organizations face. Based on the typology of uncertainty developed by Spender (1993), this paper proposed that each IT-paradigm could reduce a specific type of uncertainty.

If the relevant information exists but is not at hand (*incompleteness*), IT is used to collect the missing pieces of data. If the information is available but its meaning can not be adequately understood (*irrelevance*), IT is used to apply the appropriate methods to interpret the information. If the information is not available at any cost because of unpredictable others (*indeterminacy*), IT is used to create responses to never formulated questions. If information does not exist simply because of ambiguity, confusion and conflictive interpretations (*incommensurability*), IT is used to enact the environment.

Finally, this paper presented two propositions to guide future research efforts in this area. The first proposition consists of analyzing the IT literature to find evidence of the existence of the paradigms and metaphors. The second proposition is based on the notion

that each organization appropriates IT in its own particular way, and that narratives of praxis would illustrate the dynamics of different appropriations.

REFERENCES

Alavi, M. & Carlson, P. (1992) A review of MIS research and disciplinary development. *Journal of Management Information Systems*, 8(4), Spring, pp. 45-62.

Argyris, C. (1971) Management information systems: The challenge to rationality and emotionality. *Management Science*, 17 (6), pp. 275-292.

Barry, D. & Elmes, M. (1997) On Paradigms and Narratives: Barry and Elmes' Response. *Academy of Management Review*, 22(4), pp. 847-849.

Benbasat, I.; Goldstein, D.K. & Mead, M. (1987) The case research strategy in studies of information systems. *MIS Quarterly*, 11 (3), pp. 369-387.

Benbunan-Fich, R. (1995) Information Technology in Organizations: Tool, Machine or Weapon?, *Proceedings of the Association of Management Conference*, V.13, N. 1, pp. 147-154, 1995.

Benbunan-Fich, R. (1999) Electronic Greetings vs. Paper Cards: Managerial Challenges and Entrepreneurial Opportunities. *Journal of Applied Management and Entrepreneurship*, 5(1), September 1999, pp. 119-134.

Benjamin, R. I.; Rockart, J.F.; Scott Morton, M.S. & Wyman, J. (1984) Information technology: A strategic opportunity. *Sloan Management Review*, 25, Spring, pp. 3-10.

Bijker, W. E.; Hughes, T. P. and Pinch, T. eds. (1987) *The Social Construction of Technological Systems*. Cambridge, MA: MIT Press.

Bijker, W. E. & Law, J. eds. (1992) *Shaping Technology, Building Society*. Cambridge, MA: MIT Press.

Bruner, J. (1986) *Actual Minds Possible Worlds*. Cambridge, MA: Harvard University Press.

Child, J. (1972) Organization structure, environment and performance, *Sociology*, 6, pp. 1-21.

Courtney, J.F. DeSanctis, G. & Kasper, G. (1983) Continuity in MIS/DSS Laboratory Research: The case for a common gaming simulator. *Decision Sciences*, 14(3), pp. 419-439.

Culnan, M. & Swanson, E.B. (1986) Research in management information systems, 1980-1984: Points of work and reference. *MIS Quarterly*, 32(9), pp. 289-301.

Daft, R.L & Lengel R.H. (1986) Organizational information requirements, media richness and structural design. *Management Science*, 32(5), pp 554-571.

El Sawy, O. A. & Bowles, G. (1997) Redesigning the customer support process for the electronic economy: Insights from storage dimensions. *MIS Quarterly*, 21(4), pp. 457-483.

Flores, F.; Graves, M.; Hartfield, B. & Winograd, T. (1988) Computer systems and the design of organizational interaction. *ACM Transactions on Office Information Systems*, 6(2), April, pp. 153-172.

Galbraith, J. (1977) *Organization design*. Reading, MA: Addison-Wesley.

Giddens, A. (1979) *Central Problems in Social Theory*. Berkeley, CA: University of California Press.

Gillenson, M.L., and Stutz, J.D. (1991) Academic issues in MIS: Journals and books. *MIS Quarterly*, 15(4), pp. 447-452.

Grinyer, P.H. & Spender, J.-C. (1979) Recipes, crises, and adaptation in mature business. *International Studies of Management and Organizations*, 9(3), pp. 113-133.

Hamilton, S. & Ives, B. (1982) MIS research strategies. *Information & Management*. 5(6), pp. 339-348.

Hiltz, S.R. & Turoff, M. (1993) *The network nation: Human communication via computer*. Revised Edition, Cambridge, MA: MIT Press.

Hoffman, D.L., Novak, T.P., & Chatterjee, P. (1995). Commercial scenarios for the Web: Opportunities and challenges. *Journal of Computer-Mediated Communication* [On-line], 1 (3). Available: http://www.ascusc.org/jcmc/vol1/issue3/hoffman.html

Huber, G. P. (1990) A theory of the effects of advanced information technologies on organizational design, intelligence, and decision making. *Academy of Management Review*, 15(1), pp. 47-71.

Ihde, D. (1993) *Philosophy of Technology: An introduction.* New York, NY: Paragon House Publishers.

Ives, B. & Learmonth, G.P. (1984) The information system as a competitive weapon. *Communications of the ACM*, 27(12), pp. 1193-1201.

Jessup, L.M. & Valacich, J.S. eds. (1993) *Group Support Systems*. New York, NY: Macmillan.

Kambil, A. (1997) Doing business in the wired world. *IEEE*, May, pp. 56-61.

Kendall, J; & Kendall, K. (1993). Metaphors and Methodologies: Living beyond the systems machine. *MIS Quarterly*, 17, June, pp. 149-171.

Klein, H.K. & Hirscheim, R. (1985) Fundamental issues in decision support systems. *Decision Support Systems*. 1(1), pp. 61-110.

Kuhn, T.S. (1962) *The structure of scientific revolutions*. Chicago: University of Chicago Press.

Leavitt, H.J. & Whisler, L.T. (1958) Management in the 1980's. *Harvard Business Review*, November-December, pp. 41.

Lenz, R.T. & Engledow J.L. (1986) Environmental analysis: The applicability of current theory. *Strategic Management Journal*, Vol.7, pp. 329-346.

Morgan, G. (1986) *Images of Organizations*. Beverly Hills, CA: Sage Publications.

Morgan, G. (1980) Paradigms, metaphors and puzzle solving in organization theory. *Administrative Science Quarterly*, 25, pp. 605-622.

Ortega y Gasset, J. (1941) Toughts on Technology. Revised reprint of "Man the Technician" in *Toward a Philosophy of History*. New York: W.W. Norton.

Parsons, G.L. (1983) Information technology: A new competitive weapon. *Sloan Management Review*, Fall, pp. 3-15.

Porter, M. & Millar, V. (1985) How information gives you competitive advantage. *Harvard Business Review*, July-August, pp. 149-160.

Pfeffer, J. & Salancik, G.R. (1978) *The external control of organizations*. New York: Harper & Row, Pub.

Poole, M.S. & DeSanctis, G. (1990) Understanding the use of Group Decision Support Systems: The Theory of Adaptive Structuration. In Fulk, J. and Steinfeld, C. (eds) *Organizations and Communication Technology*. Sage Publications.

Sackmann, S.A. (1991) Uncovering culture in organizations. *Journal of Applied Behavioral Science*, September, pp. 295-317.

Scarbrough, H. & Corbett M.J. (1992) *Technology and Organization: Power, Meaning and Design*. New York: Routledge.

Scott, W. R.(1992) *Organizations: Rational, natural and open systems*. Englewood, N.J.: Prentice-Hall.

Scott-Morton, M.(1991) *The corporation of the 1990's: Information technology and organizational transformation*. Oxford: University Press.

Schumpeter, J. (1964) *Business Cycles*. New York: McGraw Hill.

Spender, J.-C. (1993) Some frontier activities around strategy theorizing. *Journal of Management Studies*, 30(1), January, pp. 11-30.

Tushman, M.L. & Nadler D.A. (1978) Information processing as an integrating concept in organizational design. *Academy of Management Review*, July, pp. 613-624.

Vitalari, N.P. & Venkatesh, A. (1987) In-home computing and information services: A twenty year analysis of the technology and its impacts. *Telecommunications Policy*, 11(1), pp. 65-81.

Walstrom, K. A; Hardgrave, B. C.; Wilson, R. L (1995) Forums for management information systems scholars" *Communications of the ACM*, 38(3) pp. 93-107

Weick, K.E. (1979) *The social psychology of organizing*. Reading, MA: Addison-Wesley.

Zuboff, S. 1988. *In the age of the smart machine*, New York: Basic Books.