INNOVATIVE CULTURES AND ORGANIZATIONS

Edgar H. Schein

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Both students of organizations and managers are today increasingly concerned about the capacity of organizations to adapt to rapidly changing environmental conditions. The rate of change in the technological, economic, political, and socio-cultural environments is increasing, and organizations are, therefore, finding it more and more important to figure out how to adapt.

Adaptation in turbulent environments involves more than minor adjustments to the present way of doing things. It often requires genuinely innovative thrusts--new missions, new goals, new products and services, new ways of getting things done, and even new values and assumptions. Most importantly adaptation involves the development of the capacity to manage "perpetual change." Organizations will have to "learn how to learn" (Schein, 1980; Argyris & Schon, 1978) and to become "self-designing" (Weick, 1977).

The difficulty is that organizations are by their nature and often by design oriented toward stabilizing and routinizing work. Organizations develop cultures that are expressed in structures and processes that permit large numbers of people to coordinate their efforts, and that permit new generations of members to continue to perform effectively without having to reinvent the organization each time (Schein, 1985). How then, can one conceptualize an organization that can function effectively yet be capable of learning so that it can adapt and innovate in response to changing environmental circumstances? How can one

conceive of an organization that can surmount its own central dynamic, that can manage the paradox of institutionalizing and stabilizing the process of change and innovation?

In this essay I want to address some aspects of these questions and to present a point of view based on my research into the dynamics of organizational culture. In particular I want to focus on innovation as itself a property of culture. In other words, what kind of organizational culture would consistently favor innovation?

This question is of especial interest at the present time because of the rapid advances that are being made in the field of information technology (IT). There is ample evidence to suggest that the introduction of IT into organizations not only forces cultural assumptions out into the open, but that the potential of IT as a strategic aid to organizations will not be fulfilled unless, at the same time, those organizations develop (or already possess) what I will define as "innovative cultures."

The definition of "innovation" is itself a major problem. For purposes of this paper I will adopt a broad and imprecise definition--new ideas, behavior patterns, beliefs, values, and assumptions covering any aspect of the organization's functioning. In particular I want to insure that we consider both 1) "content innovation"-- new products, services, and ideas pertaining to the mission of the organization, and 2) "role innovation"-- new ways of doing things, new definitions of roles, and new approaches to performing in roles (Schein, 1970; Van Maanen & Schein, 1979).

Defining what is "new" is, of course, also problematic. In analyzing a case of culture change in a large corporation, I found that some of the major changes that the organization felt it had made really reflected an affirmation of some of its most basic assumptions (Schein, 1985). What then had changed? Was there any innovation? My sense about this issue is that we must define innovation ultimately by the perceptions of both members of the organization and those outsiders who are in interaction with the organization and, therefore, in a position to perceive changes. If both insiders and informed outsiders agree that something is really "new," then we are dealing with an innovation.

This definition will not satisfy the positivistic empiricist. Measuring consensus in perceptions is difficult and messy. However, if we are to understand what really goes on in this organizational domain, and if we are to develop better concepts and theoretical insights, we are at this stage better off with the rich and messy insights of the ethnographer and the clinician (Schein, 1987).

The paper is divided into several parts. In Part I, I will provide my own view of the central variables needed to analyze organizations: 1) A socio-technical paradigm; 2) Culture; 3) Information technology; 4) Structure; and 5) Process. In Part II, I will spell out in hypothesis form what I consider to be the necessary assumptions of an innovative culture. Part III explores some of the key characteristics of IT and states several hypotheses about the relationship of IT to innovative capacity,

and Part IV states some conclusions and unresolved issues.

In order to be efficient in laying out these ideas I have made minimal references to what is a vast literature on organization design and innovation. My goal is not to summarize what we know, but to be provocative and push into an area of cultural analysis that has not, to my knowledge, been explored very much as yet.

I. A Basic Socio-technical Paradigm for Analyzing Organizations

I will start with some of my underlying assumptions about the nature of organizations. There are many models available for the analysis of organizational systems. Many of them are flawed from the outset, however, because they conceptually separate the task and technical elements from the human and organizational elements. For example, most models of strategy and organization design advocate that one should start with a concept of mission or goal, and then design the organization to fullfill that mission or goal. The human elements are typically thought of as something that follows and must be adapted to the mission and the technical/structural elements.

In contrast, a socio-technical model would argue that one must integrate the human considerations with the technical ones in the initial design process. The initial formulation of the mission and goals of the organization is, after all, a product of human beings in entrepreneurial, technical, and managerial roles. The assumptions, beliefs, values, and biases of these human actors will limit and bias the technical and

structural options considered, and will certainly affect the kind of organizational design that is evolved.

Furthermore, if the people who will be using a given system (however it may have been invented) are not involved in the initial design of the system, all kinds of unanticipated problems may arise that make the system less effective than its technical designers had forecast. We see this especially in the realm of information technology where the difficulties of implementation far outstrip the difficulties of invention.

For example, when an information system is initially designed, the human consequences are often either totally misunderstood or actively ignored. First a "small" example observed by Lotte Bailyn where the introduction of PCs to an executive group was slowed down by the frequently discovered fact that executives do not type and do not like to go into a learner mode. The enthusiastic implementers created a typing program to deal with this issue and, to provide effective feedback to the learners, arranged to have a bell ring every time a mistake was made (on the theory that an aural signal would get better attention than a visual signal). But, the signal was also public and no-one wanted others to know when they were making errors, so the system had to be redesigned with the less vivid but more private feedback signal.

A "larger" example occurred in one division of an aerospace company. The general manager needed detailed performance and schedule information for each project and program in the company, and designed a system that would provide such detail.

The system allowed him to identify schedule or performance problems as soon as they arose, so he could check on what was going wrong. He felt he needed that information to deal with his outside stake-holders.

What this manager did not anticipate was that the project managers and engineers would feel very threatened by the knowledge that their day to day behavior was being monitored. If the manager asked questions about problem areas, they found it difficult to respond because they had not had a chance to look at the reasons for the observed deviations from plan. The system designers should have anticipated this problem inasmuch as it is a well known phenomenon in the psychology of control. What typically happens is that subordinates who feel threatened or embarrassed by revealed information attempt to subvert the system by refusing the enter data or feeding in false information to protect themselves. Such behavior typically leads the system designers to invent more elaborate information devices that cannot be falsified, leading to an escalation of resentment and tension in the organization.

An even more dangerous outcome is that the subordinates become dependent on the boss to be the control system and cease to exercise whatever self-control they had been exercising (McGregor, 1960, 1967). "If the President has all the information, we will fix only those problems that he shows himself to be concerned about."

The socio-technical solution is initially to involve all the people concerned in the system design. This was eventually

done in the above case because the manager realized that it was dysfunctional to create resentment in his subordinates. The whole organization launched into a "redesign" of the system and invented a solution. It was concluded that the manager had a valid need for the information but he did not need it simultaneously with all of the employees. So the project members suggested a time delay-- they would get the information as soon as it was available so that they could get to work on any problems that were identified. The manager would get the same information a couple of days later so that by the time he inquired about problems, or even before he inquired, the project teams could tell him what was wrong and how they were dealing with it. The time delay solved everyone's problem and led to a much more motivated effective organization. The essential control stayed where the information was-- in the project teams.

Enough is known today about the human problems of information and control systems, about the design of equipment, and about the human problems of automation to make socio-technical design entirely feasible. What typically stands in the way is cultural assumptions about the role of management and the role of technical designers in the initial creation of innovations. It is for these reasons that organizational culture must be analyzed first in defining the conditions for adaptation and innovation (See Fig. 1).

Insert Figure 1 about here

The model emphasizes that one can study adaptation and innovation from the point of view of the organizational processes that must be present, from the point of view of the organizational structure that must be in place, and from the point of view of the information technology that must be available. However, inasmuch as the culture will determine how the technology is ultimately used, and will influence both the structure and the processes used by the organization, it is the cultural assumptions underlying innovation that will influence each of the other elements. Adopting a socio-technical model reminds us that we cannot bypass the analysis of the cultural and human forces at work in organizations.

Culture

The overarching determinant of how organizations work is the culture that is evolved in the organization as it's members cope with the external problems of survival in the environment and their internal problems of integration (Schein, 1985). Culture can be defined as the pattern of learned basic assumptions that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to the problems of survival and integration.

Culture manifests itself in overt behaviors, norms, and espoused values, what can be thought of as the artifacts of the culture. Culture is also expressed in some of the less conscious and operational values that members share. But unless one

deciphers the underlying, often implicit and unconscious pattern of taken for granted assumptions, one has not really analyzed the culture per se.

Culture and its overt manifestations stabilizes the daily life of members and provides meaning to what they do. Stability and hence predictability is essential for the members of an organization. Without predicatability they cannot function and cannot avoid the anxiety that attends loss of meaning. Culture, once in place, is, therefore, an inherently conservative force.

The "strength" of a culture will be a function of several variables: 1) the strengths of the initial convictions of the organizational founders; 2) the stability of the group or organization; 3) the intensity of the learning experience in terms of number of crises survived and the emotional intensity of those shared crises; 4) the degree to which the learning process has been one of anxiety avoidance rather than positive reinforcement. The more the culture serves to reduce anxiety, the more it will resist change.

Cultural assumptions tend toward a consistent paradigm to the extent that the culture creators have a consistent set of assumptions in the first place and to the extent that the organization's learning experiences provide consistency. If the members of an organization learn inconsistent things in order to survive and remain integrated, they will have inconsistent and possibly ambiguous assumptions that they can nevertheless feel comfortable with (Martin, 1987).

To the extent that culture is a learned product of group experience, there will be a culture wherever there is a group, in the sense of a set of people who share common experiences over a period of time. Inasmuch as most organizations differentiate themselves over time into many sub-groups, one will have sub-group cultures in each of them, their strength varying as a function of the same factors identified above. A total organization, then, can have a total culture as well as a set of sub-cultures, and any given member of the organization will simultaneously "possess" elements of all of the cultures that he or she is a member of (Van Maanen & Barley, 1984). And some of these will, of course, be family, community, occupational, and other groups that the person belongs to and identifies with outside of the organization.

Given that members of organizations have multiple group memberships and that they will identify to different degrees with these various groups, it is not at all anomalous to have a strong overall culture, yet have "deviant" elements within it, or to have entire sub-cultures that are deviant or "counter-cultural" because of their external connections such as to a strong professional group or an international union (Martin & Siehl, 1983).

We know that culture evolves and can be changed, but we have not analyzed carefully enough what the characteristics are of any given culture that would more or less facilitate change and innovation. Or, to put the question more directly, is it possible to conceive of a type of culture that would be innovative, that would have as its learning dynamic the invention of

environmentally responsive new solutions rather than conservative self-preservation? And is it possible to conceive of a type of culture that would favor socio-technical design innovations instead of the traditional technology driven ones?

Before answering these questions in Part II, some attention must be given to the other elements in the model.

Information Technology.

Cultures are built around and respond to the core technologies that caused the organization to be created in the first place. One may expect organizational cultures to vary, therefore, as a function of the kind of core technology that is involved. Chemical, high tech, heavy manufacturing, financial, and other service industries will each evolve somewhat different "industry" cultures that will influence organizational cultures.

But all organizations have in common the need to communicate, to get information to the right place at the right time to make it possible to appropriately divide labor and coordinate the effort of organization members. The flow of information can be likened to the life blood of the system, and the information channels can be likened to the circulatory system. The state of IT in use at any given time is, therefore, likely to be an important determinant of the organization's capacity to learn. What then should be the characteristics of the information system to maximize the capacity of the organization to learn, adapt, and innovate?

Information technology is central to this analysis

because its own evolution has made possible innovative leaps of extraordinary magnitude. Today some organizations are being designed on totally different premises by taking advantage of the capabilities of IT. We can conceptualize this best by distinguishing three kinds of utopian visions that have grown up around IT:

1) The Vision to Automate: Most of the critical functions in the organization are taken over by robots or computerized systems run by highly skilled and trained professional operators.

2) The Vision to Informate: By building accurate models of critical processes in the organization it is possible not only to automate such processes but to make the processes themselves visible and understandable to everyone in the organization. This is what Zuboff (1988) calls "informating" the organization, and obviously has tremendous implications not only for workers but for managers at all levels.

2a). Informating Up: In this vision, IT is used to aggregate and centralize as much information about all the parts of the organization as possible to facilitate planning and control by top management. The organization becomes transparent to its top management.

2b). Informating Down: In this vision the design of systems forces an analysis of the core production and other processes of the organization and makes those transparent to workers. Instead of understanding only a small piece of the total process, workers become familiar with the whole process and can, therefore, make decisions that previously were made by

various layers of management.

3) The Vision to Transform: A few organizations think of even more radical innovations by asking how one might organize the basic work, the communication patterns, and authority relations, to fully take advantage of the possibilities inherent in IT. Socio-technical design considerations become primary to integrate the technical and human capabilities.

Such organizations may take a totally different form, being more like complex networks in which communication and authority chains shift around and change according to the requirements of the task and the motivation and skills of the people.

Adaptation and innovation are involved to varying degrees in each of these visions, but in the vision to automate and the vision to informate up, we are only talking of converting processes that are already happening into more efficient execution of those same processes. Thus robots and various other kinds of machine controlled work are important innovations in the production process, and sophisticated information systems that permit high levels of centralized control are innovations in the degree to which information can be rapidly collected and centralized, but it is only with informating down and transforming that we get more radical innovation in the nature of the organization itself. In these instances IT creates new concept of how work is to be done and how the management process itself is to be defined. What this means is that the cultural assumptions about the nature and use of IT will themselves be a crucial determinant

of how IT will be used to create further innovation.

Organizational Processes.

Over time every organization develops a set of processes, recurrent events that insure that the primary task of the organization is fulfilled and that permit the members of the organization to coordinate effectively with each other. Such processes concern how members communicate with each other, how they solve problems and make decisions, how they implement decisions arrived at, how they organize work, supervise, reward, punish, and, in general deal with people (Schein, 1987, 1988).

Such processes are a reflection of the culture as defined above, but the basic cultural assumptions are largely implicit and invisible, whereas the processes that evolve over time are visible and analyzable. In order to fully understand any given organization, therefore, we need to specify both the underlying assumptions and the observable processes. For purposes of this analysis, then, the question is what kinds of cultural assumptions must be present to facilitate organizational processes that will increase the likelihood that the organization will be able to learn, adapt, and innovate?

Organizational Structure.

Some processes become stable and are articulated in rules, manuals, organization charts, and other more permanent documents reflecting how management feels things should be done. The ultimate division of labor as embodied in job descriptions

and organizational units, the basic organization design in terms of who reports to whom and who is accountable for what are typically thought of as the major elements of the "formal" structure. But as in the case of organizational processes, these structures are ultimately a reflection of the underlying cultural assumptions. One of the common misconceptions in this area is that structure can be analyzed as a factor separate from culture. If one starts with a socio-technical model of organizations, one cannot separate structure from culture. One can, however, ask whether some formal structures are more likely to facilitate or encourage learning, adaptation, and innovation, and, if so, what kinds of cultural assumptions will favor the evolution of such structures?

In most organizations one also finds an "informal" structure, those processes that are observed to be relatively stable but are supported only by implicit norms and are often regarded to be unsanctioned or even to run counter to the formal structure. It is the existence of such counter structures based on sub-cultures that may be "counter-cultures" that may determine in important ways what kind of innovation is possible.

The informal structure also includes "compensatory" or "parallel" structures that are designed to offset or supplement what may be weaknesses and dysfunctional elements in the formal structure (Schein, 1980, 1988). Such compensatory or parallel structures may be relatively permanent such as standing committees or may be temporary processes such as task forces and project teams set up to work only on specific and time bound

tasks.

Most organization theories acknowledge the fact that without the informal organization things simply would not get done effectively, and, therefore, that the informal structure must be explicitly analyzed and well understood if we are to understand the total system and how it works. For purposes of this paper the question then becomes what kind of cultural assumptions would favor the evolution of patterns of formal and informal structure that would most favor learning, adaptation, and innovation?

To sum up, it is my argument that in order to determine the necessary and sufficient conditions for an innovative organization, we must specify the characteristics of the culture that favor the kind of information technology, organizational processes, and formal and informal organizational structure that increases the likelihood of the occurrence of innovation.

II. Characteristics of an Innovative Culture.

Organizational cultures can be analyzed along many dimensions. I will specify a minimum set, as shown in Table 1, and state in hypothesis form the assumptions necessary for innovative capacity. Table 1 can also be used as a diagnostic device for analyzing any given culture.

Insert Table 1 about here

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1. Organization-environment Relationships.

HYPOTHESIS C1. THE CAPACITY OF AN ORGANIZATION TO INNOVATE WILL INCREASE TO THE EXTENT THAT IT ASSUMES THAT ITS ENVIRONMENTS ARE CONTROLLABLE, CHANGEABLE, AND MANAGEABLE.

Organizations can be distinguished by the shared assumptions they hold about the degree to which they dominate or are dominated by their various environments. At one extreme we have organizations that feel completely dependent and assume that their existence and survival is out of their own control. They act fatalistic and are passive in the face of environmental turbulence. They accept whatever niche the environment provides.

At the other extreme we have organizations that hold the shared assumption that their own behavior will influence the environment and that survival and growth are a function of the extent to which they actively are able to dominate some aspects of their environment. Implied is the further assumption that progress and improvement are possible, a basically optimistic orientation toward the environment.

Innovative capacity will increase to the extent that members assume that innovation is possible and necessary, which derives from their optimistic assumption that the environment can be influenced. Organizations that pessimistically assume either that they are dominated by others and/or assume that their environments are fixed will find it difficult to conceive of new ideas and will find it even more difficult to marshall the energy

to try out new ideas.

2. The Nature of Human Activity.

HYPOTHESIS C2. THE CAPACITY OF AN ORGANIZATION TO INNOVATE WILL INCREASE TO THE EXTENT THAT IT ASSUMES THAT THE APPROPRIATE HUMAN ACTIVITY IS TO BE PROACTIVE, ORIENTED TOWARD PROBLEM SOLVING AND IMPROVING THINGS.

All organizations make implicit assumptions about whether the appropriate behavior of members is to be 1) reactive, fatalistic, and oriented to getting what pleasure one can out of one's lot in life (Dionysian), 2) to be proactive, optimistic, and oriented toward improving things (Promethean), or 3) to take a middle ground of trying to harmonize and compromise between one's own needs and whatever environmental constraints and possibilities exist (Apollonian). As will be noted these assumptions are the individual level counterpart to the assumptions relating the organization to its environment.

An innovator in the midst of reactive or harmonizing people will find it virtually impossible to get even an audience much less a commitment to new ways of doing things. In Dionysian or Apollonian organizations, innovators are likely to be called whistle-blowers, boat rockers, or trouble makers, and thus to be neutralized. And if the culture is too fatalistic it will of course not attract or retain innovators in the first place.

One may wish to speculate whether there is an upper

limit to activity orientation. If there are too many innovators and if the culture strongly encourages innovation will that cause other problems that, in the end, will undermine innovation by making life too chaotic and unpredictable? I believe not, because if too much innovation becomes a problem, the organization will invent and evolve processes and structures that reduce innovation to a tolerable level. In other words, if the organization is going out of control, its own innovativeness will enable it to invent mechanisms to achieve greater discipline and control.

The reverse is not true. An organization that is too passive or fatalistic cannot invent "proactivity." It will stagnate until it fails or is taken over by others who will forcibly change the culture by massive replacement of people with a different activity orientation. I am hypothesizing, therefore, that one cannot have too much innovativeness but one can have too much conservatism and passivity.

3. The Nature of Reality and Truth.

HYPOTHESIS C3. THE CAPACITY OF AN ORGANIZATION TO INNOVATE WILL INCREASE TO THE EXTENT THAT IT ASSUMES THAT TRUTH IS TO BE ARRIVED AT BY PRAGMATIC (VS. MORALISTIC) MEANS.

Organizations can be distinguished by the degree to which they hold shared assumptions about how one determines whether something is true or not. When a complex decision has to

be made involving uncertain futures and information of uncertain validity, what criteria does the organization use to determine when it has enough and the right kind of information to make the decision?

At one extreme one finds a heavy reliance on tradition, dogma, the authority of moral principles, or the wisdom of elders. At the other extreme one finds pragmatism embodied either in a search for scientific verification or a trial and error attitude if formal verification is not possible or practical (England, 1975). If the decision is in a domain where verification by physical means is not possible, pragmatism would imply that the decision makers debate out the issues and subject each alternative to sufficient scrutiny that the one that survives can be accepted with some measure of confidence.

In organizations dominated by dogma or authorities of various sorts it is not only difficult to articulate new ideas but even more difficult to get the sanction to try them out. An exception is, of course, the situation where the innovator is the person in authority, a situation that arises from time to time in history but that is hard to specify as an organizational condition or to predict. To increase the innovative capacity generally, a positive value must be put on novelty, on breaking tradition, on trying out new things even if they are risky, and such a value must be supported by an underlying assumption that "the truth" is not already known.

The pragmatic end of the continuum also implies a more positive attitude toward trial and error, risk taking, and the

acceptance of unsuccessful efforts or failures. The more the organization is committed to dogmas, rules, systems, and procedures that become institutionalized, the harder it will be for members to take the risks necessary for innovation to succeed. The message in such moralistic organizations is "try new things only if you are sure you will not break rules or fail," a prescription for conservatism and playing it safe.

4. The Nature of Time.

HYPOTHESIS C4A. THE CAPACITY OF AN ORGANIZATION TO INNOVATE WILL INCREASE TO THE EXTENT THAT IT IS ORIENTED TO THE NEAR FUTURE (VS. PAST, PRESENT OR FAR FUTURE).

HYPOTHESIS C4B. THE CAPACITY OF AN ORGANIZATION TO INNOVATE WILL INCREASE TO THE EXTENT THAT IT USES MEDIUM LENGTH TIME UNITS (VS. SHORT ONES THAT DONT ALLOW INNOVATION TO DEVELOP OR LONG ONES THAT MAKE INNOVATION DIFFICULT TO EVALUATE).

All organizations hold implicit assumptions about the relative importance of the past, the present, and the future, and all organizations have implicit assumptions about the appropriate length of time units for different kinds of tasks. Some organizations measure themselves in short units such as weeks or months, some use intermediate units such as quarters and years, and some use longer units such as 5 or 10 year spans. All organizations use all of these units for various different purpo-

ses, and, as Lawrence and Lorsch (1967) pointed out years ago the different functional units of an organization such as sales and R & D will have very different assumptions about what it means to be "on time" and how long units of work are.

It is likely that in each organization's culture there will be found assumptions about the "really important" time units. The actual size of the relevant time units will vary from company to company, so the determination of what is "past," "present," "near future," and "far future" must be determined for each organization studied by getting members' consensus on these units. The size of such time units is also influenced by the core technologies that the organization is working with. The development of new products, for example, takes much longer in the pharmaceutical industry than in the consumer goods industry.

Organizations that live in the past or present will find it difficult to place a value on novelty because they are focused on what has worked or is working now. People with new ideas can be dismissed easily because their ideas do not "fit" what the organization likes to think about. On the other hand, if the organization is focused on the <u>far</u> future it may be unable to launch any innovation because it is assumed that there is always plenty of time to try things "in the future." A near future orientation should, therefore, be most favorable to innovation.

It is also clear that too short a time orientation will always make innovation difficult because one can always show that short-run costs are too high to justify continuation of the trial and error involved in innovation. On the other hand, if

the time units are too long, some innovations that are failures will be allowed to continue too long, the organization will lose money, and the whole innovation process will be undermined because people will remember how they were hurt by past innovations. The ability of the organization to develop a sense of an optimal length of time for an innovation thus becomes a very important determinant of its learning capacity.

This optimal length of time will be subjectively defined in most organizations, and must be measured within each organization, as indicated above. The precise length of the units is not as important as the members' ability to recognize that giving an innovation too little or too much time is equally destructive to the overall innovation process.

Optimal length time units also play a role in the selling of an innovative vision, whether that comes from leaders or from other innovators in the organization. The vision of the future cannot exceed the ability of members of the organization to understand what is proposed, nor can it promise benefits that will only be realized by the next generation. To be motivated to implement something new, people have to be able to see what benefits that will bring them within their own "lifetime."

As Jaques has argued (1976, 1982) the length of time over which organization members have "discretion" appears to vary with organizational rank. On the shop floor supervisors check on employees by the hour or the day. At lower managerial levels one has discretion over weeks, and so on up the ladder until the most senior management is supposed to define its tasks in terms of

years. In communicating the future impact of proposed innovations it becomes critical then to consider over what time units the audience is used to thinking. "Optimal" time units, in this context, are partly defined by the actual innovative task that is being proposed or undertaken.

5. The Nature of Human Nature.

HYPOTHESIS C5. THE CAPACITY OF AN ORGANIZATION TO INNOVATE WILL INCREASE TO THE EXTENT THAT IT ASSUMES THAT PEOPLE ARE ULTIMATELY NEUTRAL OR GOOD, AND, IN ANY CASE, ARE CAPABLE OF IMPROVEMENT.

Organizations make implicit assumptions about human nature, both in terms of whether it is ultimately good, neutral, or evil, and in terms of how malleable or fixed it is. If organizations are cynical about human nature (McGregor's Theory X) they will not encourage innovation or, worse, will mistrust innovators as having ulterior motives. In such organizations innovative capacity often is devoted to defeating organizational goals. Workers invent elaborate processes and devices to make life easier for themselves at the expense of organizational efficiency (Argyris, 1964; McGregor, 1960; Roethlisberger & Dickson, 1939).

On the other hand, if the organization holds optimistic assumptions about human nature (McGregor's Theory Y), it will expect people to be innovative, will encourage innovation, will listen to new ideas, and will be more likely to trust them. At

the same time, for innovation to be encouraged organization members must feel that they are all "perfectible" in the sense that one's personality and contribution is not fixed. If one knows one can grow and improve, this knowledge (assumption) acts as a powerful stimulant to personal development and innovation.

6. The Nature of Human Relationships.

HYPOTHESIS C6A. THE CAPACITY OF AN ORGANIZATIONN TO INNOVATE WILL INCREASE TO THE EXTENT THAT IT ASSUMES THE IDEAL OF INDIVIDUALISM AND THE PURSUIT OF INDIVIDUAL DIVERSITY.

HYPOTHESIS C6B. BUT, IF AN ORGANIZATION HAS A FEW INNOVATIVE INDIVIDUALS WHOSE IDEAS ARE ADOPTED, IT CAN IMPLEMENT SOME TYPES OF INNOVATIONS FASTER TO THE EXTENT THAT IT ASSUMES THE IDEAL OF GROUPISM.

HYPOTHESIS C6C. THE CAPACITY OF AN ORGANIZATION TO INNOVATE WILL INCREASE TO THE EXTENT THAT IT ASSUMES THAT COLLEGIAL/PARTICIPATIVE METHODS OF DECISION MAKING ARE THE MOST APPROPRIATE.

HYPOTHESIS C6D. BUT, IF AN ORGANIZATION HAS INNOVATIVE PEOPLE IN SENIOR LEADERSHIP ROLES, IT CAN IMPLEMENT SOME INNOVATIONS FASTER TO THE EXTENT THAT IT ASSUMES AUTHORITARIAN/PATERNALISTIC METHODS OF DECISION MAKING.

This dimension of culture has to do with prevailing

assumptions about the ideal human relationship. Two dimensions are involved here:

1) The degree to which the organization assumes the ideal of "individualism" (that all good things ultimately come from individual effort) or "groupism" (that all good things ultimately come from the group, implying that ultimately all individuals must subordinate themselves to the group), and,

2) The degree to which ideal relationships are seen as collegial/participative (implying that power and influence in decision making is a function of who has what expertise relevant to any given task to be accomplished) or as autocratic/paternalistic (implying that power and influence reside in positions, statuses and roles, or are a function of the specific personality of the individual).

The hypotheses around these two dimensions are more complex and contingent because under certain conditions innovation could occur anywhere along these two dimensions. Basically a culture that values individuals and individual diversity will have more ideas to draw from and create more incentives for ideas to be put forward. However, when it comes to acceptance of ideas and implementation, the strongly individualistic organization may be at some disadvantage. In other words, in a groupist organization it will be harder to get new ideas to be articulated, but if they are adopted, such an organization will be far more effective in implementing them because individuals who may dissent will suppress their dissent for the sake of the total group's welfare.

In such organizations the burden of innovation probably

falls on the leadership in that they are the most likely to be able to get an idea adopted in the first place. What the determinants are of innovativeness in the leaders of groupist organizations then becomes the secondary but critical question.

Collegial/participative decision making is more likely to identify the relevant areas in which innovation is needed, to surface good ideas, to stimulate creativity, and to produce a state of affairs where everyone understands the idea so that it will be properly implemented. This assumption is central because collegial/participative decision making influences so many phases of the total innovation process from invention to implementation, particularly if the new idea or process is complex and hard to understand.

If, on the other hand, an autocratic or paternalistic leader has innovative ideas that are sound, if the ideas are not too complex to communicate, and if the socio-technical implications have been correctly thought through, it is possible for the organization to implement such ideas more rapidly and totally.

The danger in this situation is threefold: 1) That the leader will impose an idea that is wrong under conditions where subordinates are neither motivated nor rewarded for pointing out the potential problems; 2) That the idea will not be successfully communicated leading to paralysis and frustration; or 3) That the idea will be implemented incorrectly because the leader did not discover that subordinates did not fully understand what he or she had in mind and/or did not accept the consequences of the innovation.

One additional point bearing on this assumption needs to be brought out. If predictions about the ultimate impact of IT are correct, then leaner, flatter, more highly networked organizations are the likely consequence (Drucker, 1988; Malone, 1987). Such organizations cannot work effectively, however, if their managers are still operating from hierarchical models buttressed by autocratic or paternalistic assumptions (Schein, 1989). The basis of authority in such networks will more likely be the degree of skill or expertise that any given member has at any given moment in time relative to the task to be done. Positional authority will mean very little. Obviously such systems will function better if they hold collegial/participative assumptions in the first place.

7. Sub-cultural Diversity.

HYPOTHESIS C7. THE CAPACITY OF AN ORGANIZATION TO INNOVATE WILL INCREASE TO THE EXTENT THAT IT ENCOURAGES DIVERSE BUT CONNECTED SUB-CULTURES.

As organizations grow and mature they develop sub-cultures as well as overarching cultures. The nature and diversity of such sub-cultures will influence the organization's innovative capacity. For any given group, culture is a homogenizing force. However, if the organization contains within its total system, enough diverse sub-systems with their own diverse sub-cultures, it can manage to innovate by empowering people and ideas from

those sub-cultures that are most different from the "parent" yet best adapted to a changing environment. Drawing on diverse sub-cultures is, in fact, the commonest way that cultures evolve, and this process, if properly managed, is therefore one of the most important sources of potential innovation.

The sub-cultures must be connected and part of a parent culture or their elements will not be seen as relevant if introduced into the parent. For example, in a highly geographically decentralized organization new ideas may well spring up in an overseas subsidiary, but those ideas are only importable into the parent organization if the subsidiary is perceived to be genuinely part of the larger culture. If the ideas are brought in via transfer of people from the subsidiary, those people will only have credibility and influence if they are perceived to be part of the larger culture and sympathetic to it.

It is this diversity within unity theme that accounts for so many current management statements that the effective organization is one that can both centralize and decentralize, that can be loose and tight at the same time. To restate the point, diversification and decentralization are effective as innovative forces only to the extent that the separate units are perceived to be and feel themselves to be connected to the whole. If they do not feel connected they will not be motivated to innovate on behalf of the whole. If they are not perceived to be connected, their ideas will not be perceived as relevant.

Summary.

To summarize, in order to be innovative an organizational culture must assume:

1) That the world is changeable and can be managed,
2) That humans are by nature proactive problem solvers,
3) That truth is pragmatically arrived at,
4) That the appropriate time horizon is near future,
5) That time units should be geared to the kind of innovation being considered,
6) That human nature is neutral or good and is, in any case, perfectible,
7) That human relationships are based on individualism and the valuing of diversity,
8) That decision making is collegial/participative,
9) That diverse sub-cultures are an asset to be encouraged, but that sub-cultures have to be connected to the parent culture.

Having stated these conditions for what must be true in the overall culture, what further conditions must be present in the state of information technology?

III. Characteristics of an Information Technology for Innovation.

I am making the assumption that any open system can function only if it can take in, move around, and appropriately process information. Information is the life blood, and information channels are the circulatory system of the organization. If the organization is to be capable of innovation, what must be true of the information system?

Parenthetically, I am assuming that if the above specified cultural conditions are not present, the organization is not likely to develop or implement an ideal information system, or if such a system should for some reason be present, it will misuse the system in ways that I will detail below. So having an ideal system from a technological point of view will not by itself solve the problem of innovation. Technology alone will not cause things to happen. However, given the right conditions for innovation in the culture, it is possible to specify how an information system will enhance the chances for innovation.

1. Networking capacity.

HYPOTHESIS IT1. THE CAPACITY OF AN ORGANIZATION TO INNOVATE WILL INCREASE TO THE EXTENT THAT IT HAS TOTAL NETWORKING CAPACITY.

My assumption here is that both the capacity to invent new ideas and the capacity to implement innovations may require at any given point in time connecting everyone to everyone else. I am not assuming that those connections have to be operational at all times, only that it will favor innovation if the capacity is there. Especially important will be channels between sub-cultures so that new ideas that may arise in sub-cultures have a chance of being perceived by other sub-cultures and the parent culture.

The network does not have to be electronic. It can exist in the form of frequent meetings that involve everybody, a

heavy travel schedule that gets everyone to all parts of the organization, an efficient mail system, a good phone system, etc. The more sophisticated technologies become more relevant as the constraints of time and space become more costly.

2. Routing and filtering capacity.

HYPOTHESIS IT2A. THE CAPACITY OF AN ORGANIZATION TO INNOVATE WILL INCREASE TO THE EXTENT THAT IT CAN OPEN AND CLOSE CHANNELS AS NEEDED.

HYPOTHESIS IT2B. THE CAPACITY OF AN ORGANIZATION TO INNOVATE WILL INCREASE TO THE EXTENT THAT IT CAN FILTER INFORMATION IN THE CHANNNELS AS NEEDED.

My assumption here is that a fully connected network is not desirable at all times. For certain kinds of tasks and for certain stages of the innovation process, it may be more efficient to keep open only those channels that are necessary for efficient implementation. The organization must have the process capacity to diagnose its information needs but it must also have the technical capacity to implement its diagnosis in the sense of opening and closing channels as needed.

In arguing for this capacity I am not reverting to an authoritarian system, i.e. some higher authority that opens or closes channels as needed. I am suggesting that such capacity can be available in a collegial/participative system as well in

that members can choose to open and close channels themselves as they perceive this to be appropriate.

Just as the organization needs the technical capacity to open and close channels, so it needs the capacity to filter information flows along given channels to 1) avoid information overloads, 2) to prevent inappropriate information getting to some members, and 3) to insure that appropriate information gets to those members who need it. Again this implies diagnostic capacity along with the technical capacity of the system, and again, it implies that such filtering can be designed without reverting to an authoritarian hierarchical system. A good example of such a system is the Information Lens and Object Lens technology developed by Malone that allows the members of the network to specify rules for routing and filtering that are then automatically implemented (Lai & Malone, 1988; Malone, et al, 1989).

3. Connectivity to Environment; "Openness" of the system.

HYPOTHESIS IT3. THE CAPACITY OF AN ORGANIZATION TO INNOVATE WILL INCREASE TO THE EXTENT THAT IT HAS MULTIPLE OPEN CHANNELS TO AND FROM ITS ENVIRONMENTS.

Organizations are open socio-technical systems embedded in multiple environments. If they cannot accurately track what is going on in those environments they cannot identify areas in which innovation is more or less important. Similarly, they can-

not assess the effects of their own innovative and adaptive efforts if they cannot observe the effects of their innovative behavior on those parts of the environment that are intended to be impacted.

Multiple channels to the environment are necessary, but they must also be connected to the appropriate decision points within the organization so that the incoming information can be processed appropriately. Many organizations know a great deal but the knowledge stays in departments that cannot effectively utilize, integrate, and act on the knowledge (Schein, 1980).

4. Capacity to evolve own IT system technologically.

HYPOTHESIS IT4. THE CAPACITY OF AN ORGANIZATION TO INNOVATE WILL INCREASE TO THE EXTENT THAT IT HAS THE CAPACITY TO FULLY UNDERSTAND AND IMPLEMENT INNOVATIONS IN INFORMATION TECHNOLOGY ITSELF AS THESE MAY APPLY TO VARIOUS ASPECTS OF THE ORGANIZATION'S TASKS.

What is implied here is the organization's capacity to modify its own use of IT as new possibilities become available and as new ideas arise on how to use existing technology. This means that somewhere in the total system must reside good information on current capacities and good information on future possibilities. Such information may come from internal or external sources, but the information has to get to the right places to be acted on approptiately. Various aspects of IT such

as office automation, CAD/CAM, and so on must not only be well understood, but must be flexibly adopted to support the basic mission of the organization (Thomas, 1988).

IV. Interaction of Culture and Information Technology

Implied in the above analysis is that cultural assumptions can and will limit the degree to which IT can be and will be used. The kind of information network described above will simply not be installed in organizations that do not believe in proactivity, in mastering their environment, in participative decision making, and so on. But that is not the whole story. The technology itself can and will gradually affect organizational cultures by what it makes possible, and in some cultures the interaction between the culture and the technology will, in the long run, be destructive to adaptive capacity and innovation. In order to examine these interactions we must first examine some of the properties of I.T. and show how those can become forces to unfreeze the present culture.

I.T. as a force unfreezing culture.

If one thinks of the information technology community as itself a sub-culture, one can identify certain of its assumptions that, if implemented lead to the unfreezing of other cultural assumptions. Specifically, the IT community assumes that it is intrinsically good for organizations to have more information, more widely distributed, and more rapidly disseminated. The designers of IT are therefore likely to highlight the following properties of the technology. IT increases:

1) Accessibility: more people can more easily access information that is electronically available in a network;

2) Rapidity: information and feedback can be obtained much more rapidly by electronic means in computer based networks;

3) Simultaneity: information can be presented to large numbers of people simultaneously even though they are geographically dispersed and are in different time zones;

4) Presentational flexibility: information can simultaneously be presented in different ways to different people;

5) Complexity: complex relationships and contextual factors in information can be more easily represented with computer aided systems (e.g. three dimensional modelling);

6) System awareness: creating information systems requires accurate modelling of processes, and these models then become transparent to information users (the essence of what Zuboff means by "informating");

7) System/network accountability: networks make it possible for all members to become aware of their mutual interdependence, of the fact that there is no necessary higher authority in the network, and hence that all members of the network can be simultaneously accountable for network output;

8) Team work capacity: the combination of simultaneity and network accountability makes it possible for real team work to occur where every member realizes his or her part, and where all contributions are transparent, thus forcing mutual trust (i.e. any abuse by any member is immediately visible to all other members of the network);

9) Task based authority: in a functioning network it is possible to designate decision making power to whoever at any given moment in time has the most relevant information, and this authority can rotate among members of the network as the task changes;

10) Self-designing capacity: it is technologically and psychologically possible for the network to constantly redesign itself and to adapt to changing circumstances if the necessary power and flexibility have been built in initially.

As can be seen, these characteristics introduce a strong bias toward collaborative team work in that such work becomes not only much more feasible in an electronic environment, but also more appropriate to the complex tasks that most organizations will face in the future.

What all of this means is that the introduction of IT is a force that may stimulate culture change by first of all forcing some cultural assumptions out into the open (i.e. assumptions about formal authority and managerial prerogatives), and second, by clearly making alternative methods of coordination possible. Thus if either the leadership of a total organization or some sub-culture within the organization introduces sophisticated IT networks, this will force cultural re-examination and reveal which cultural assumptions will aid or hinder further utilization of IT. The further implication of this line of argument is that the introduction of IT may be one of the most powerful ways of unfreezing a culture and starting a process of change toward more innovative capacity in general.

1. Presence of an IT subculture.

HYPOTHESIS I/C 1: THE CAPACITY OF AN ORGANIZATION TO INNOVATE WILL INCREASE TO THE EXTENT THAT IT HAS SOMEWHERE WITHIN ITSELF A FULLY FUNCTIONING TECHNOLOGICALLY SOPHISTICATED I.T. SYSTEM THAT CAN BE A DEMONSTRATION OF I.T. CAPACITY AND A SOURCE OF DIFFUSION TO OTHER PARTS OF THE ORGANIZATION.

In other words, there must be among the sub-cultures of the organization at least one sub-subculture that is congruent with the assumptions of IT or there will not be any place within the organization where IT can be appropriately utilized. However, such a sub-culture is only a necessary and not a sufficient condition for organizational innovation, because the larger culture may prevent diffusionn of the innovation.

2. Destructive I.T./culture interactions.

HYPOTHESIS I/C 2A: THE PROVISION OF I.T. FOR PURPOSES OF AUTOMATION TO A MANAGEMENT THAT OPERATES BY THE ASSUMPTIONS OF THEORY X WILL IN THE SHORT RUN PRODUCE PRODUCTIVITY IMPROVEMENTS BUT IN THE LONG RUN WILL PRODUCE EMPLOYEE DEPENDENCE AND ANXIETY THAT WILL REDUCE THE PROBABILITY OF INNOVATION.

HYPOTHESIS I/C 2B: THE PROVISION OF I.T. FOR PURPOSES OF UPWARD INFORMATING TO A MANAGEMENT THAT OPERATES BY THE ASSUMPTIONS OF

THEORY X WILL ALLOW SUCH MANAGEMENT A LEVEL OF SURVEILLANCE AND CONTROL THAT WILL ALIENATE EMPLOYEES, CAUSE RESISTANCE, REBELLION, REFUSAL TO USE THE SYSTEM, FALSIFICATION OF DATA ENTRY IF POSSIBLE, AND ULTIMATELY, TOTAL DEPENDENCY AND ABDICATION OF PERSONAL RESPONSIBILITY.

HYPOTHESIS I/C 2C: THE PROVISION OF I.T. FOR PURPOSES OF INFORMATING DOWN TO A MANAGEMENT THAT OPERATES BY THE ASSUMPTIONS OF THEORY X WILL PRODUCE SHORT RUN PRODUCTIVITY AND INVOLVEMENT GAINS, BUT WILL, IN THE LONG RUN, BE SUBVERTED BY MANAGEMENT'S NEED TO CONTROL AND TO ASSERT WHAT IT REGARDS TO BE ITS PREROGATIVES AND RIGHTS.

HYPOTHESIS I/C 2D: A THEORY X MANAGEMENT WILL NOT BE ABLE TO TRANSFORM AN ORGANIZATION IN TERMS OF I.T. CAPABILITIES BECAUSE THE HIERARCHICAL CONTROL MENTALITY WILL PREVENT THE NECESSARY EMPLOYEE INVOLVEMENT IN SYSTEM DESIGN AND UTILIZATION.

If one examines cases of IT implementation failure, there are some specific patterns that not only explain the failure but that suggest certain interactions which, even if successful in the short run, would be destructive to the organization's longer range capacity to innovate and adapt. These interactions involve specifically the cultural assumptions around participation and control, and are shown in Table 2.

Insert Table 2 about here

The various IT visions are shown down the left side and the two cultural extremes with respect to participation and control are shown along the top. These can most easily be characterized in terms of McGregor's Theory X and Theory Y, especially as these apply to the CEO or senior management as individuals.

The specific hypotheses embedded in Table 2 have been stated above. The logic behind the first of these hypotheses derives from prior and current research on automation, especially the research of Hirschhorn (1987), which shows that workers in highly automated plants become anxious because of their high level of responsibility, and the absence of supportive bosses. Because they often do not understand the complex technology they become highly dependent on information that they do not understand. This combination of dependency and anxiety can lead to psychological denial and the inability to manage any crisis conditions that may arise. That is, when the system sends alarm signals, the anxiety level is so high that workers assume that the information must be wrong and ignore it.

The scenario underlying the second hypothesis has been played out in a number of organizations, and is potentially the most dangerous because the sub-culture of IT plays directly into the assumptions of a control oriented Theory X management. In the short run there is the illusion that the IT system has given management the perfect and ultimate control tool, especially if the system designers can also be categorized as Theory X. If one

has control oriented designers working with control oriented managers one is bound to get an organization that will look perfectly controlled but that will sooner or later fail for lack of employee commitment and involvement. And certainly there will be no motivation or capacity to innovate.

Evidence for the third hypothesis comes from Zuboff's study of the paper mill that dramatically increased its productivity as workers learned the logic behind the automated system they were using and discovered that they could run the plant perfectly well without lots of managerial control. But managers were not willing to give up this control; they started to order workers to do things that they already knew how to do, and to take credit for some of the improvements, leading workers to resentfully abdicate and consequently to underutilize the system.

What is important to note is that the same system implemented with a Theory Y management would have entirely positive results because the managers would be happy to have workers exercise more control and take over the system. It is only the control need characteristic of the Theory X manager that produces the destructive negative results.

The fourth hypothesis is self-evident, in that the Theory X dominated organization will not have transformational visions in the first place, and will not be able to elicit the innovative capacity to start a transformation process.

In summary, the capabilities of IT in combination with a hierarchically control oriented management will produce negative results in each of the IT visions, though those results may not

show up initially. If the designers of the system are also operating from hierarchical control assumptions we have the potential of great harm to the organization in terms of its long run ability to innovate and to adapt to changing environmental circumstances.

The implication is that the cultural assumptions around employee involvement, the importance of hierarchy as a principle of control, the prerogatives and rights of managers, and the nature of authority are the critical ones to examine in any IT project, because the potential of IT as a force for innovation will not be achieved if those assumptions are too close to Theory X.

Summary and conclusions.

We can summarize the hypotheses about IT by stating that an organization's capacity to innovate will increase to the extent that it has:

1) The capacity to connect everyone,
2) The ability to open and close channels as needed,
3) The ability to filter information in the channels,
4) Multiple channels into and from the relevant environments, and to the relevant decision centers,
5) The capacity to use the most advanced IT systems,
6) At least one fully functioning advanced IT system somewhere within the organization,
7) A Theory Y management that will use the IT applications appropriately and sensitively.

We noted that culture will constrain the ability to implement IT solutions, but, at the same time, IT is a powerful force to surface and unfreeze cultural assumptions if it can be introduced anywhere in the organization.

If the IT capacity is present and if the cultural assumptions favor innovation, the organization will develop processes and structures that will increase the likelihood of members inventing and implementing those new ideas that will make the organization more adaptive in a rapidly changing environment.

The crucial point of this analysis is to note that if such technological and cultural conditions are not present, it is pointless to work on organizational processes and structures directly. People will simply resist the kinds of changes that may be necessary. Only if we can create the appropriate synergy between culture and IT capability will we get the long range benefits we are looking for.

The interweaving of cultural and technological factors is the essence of the socio-technical model of organization design. I hope that the above hypotheses can stimulate thinking about how to increase the probability of innovation, and can serve as a kind of diagnostic grid to assess in any given group the degree of "innovativeness." Above all, I hope that by focusing on culture I have made it clear why resistance to change and the desire of organizations <u>not</u> to innovate are entirely normal and understandable phenomena.

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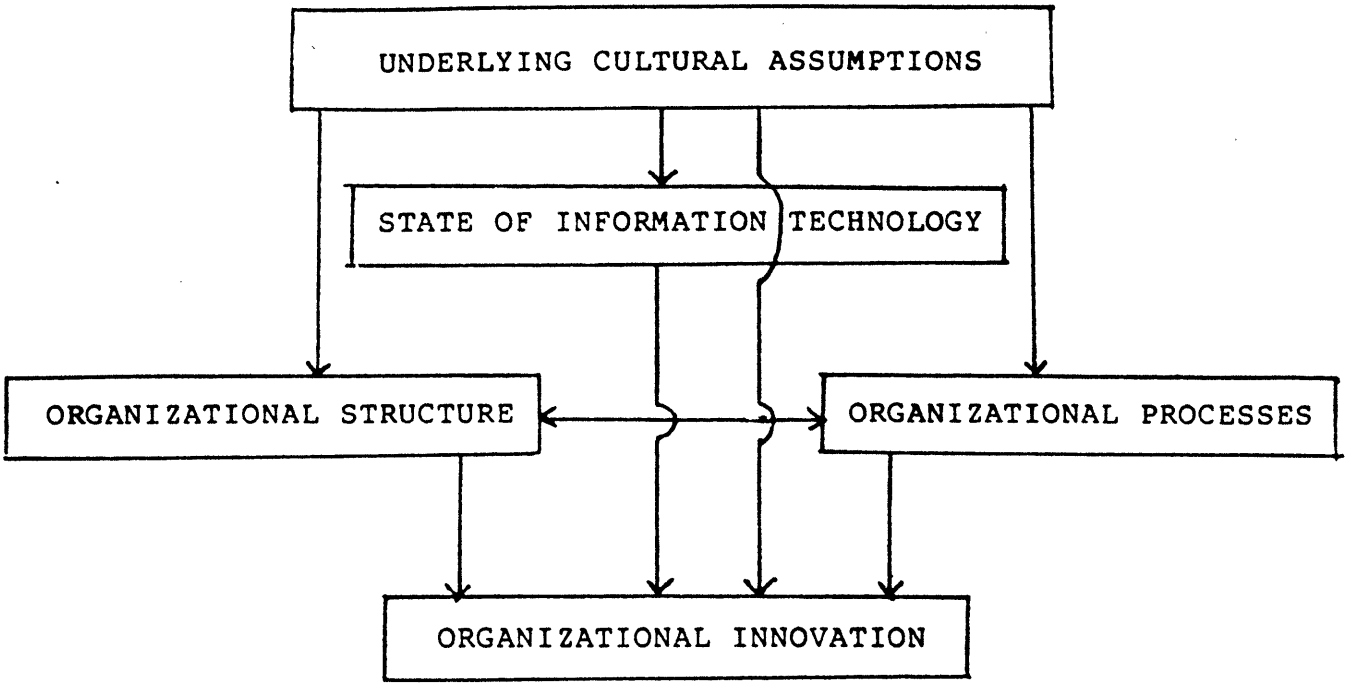

FIGURE 1. A SOCIO-TECHNICAL MODEL OF ORGANIZATIONAL INNOVATION

TABLE 1

CULTURAL DIMENSIONS THAT INFLUENCE INNOVATIVENESS*

1. ORGANIZATION-ENVIRONMENT RELATIONSHIP

Environment Dominant	Symbiotic	Org. Dominant
		X

2. NATURE OF HUMAN ACTIVITY

Reactive, fatalistic	Harmonizing	Pro-active
		X

3. NATURE OF REALITY AND TRUTH

Moralistic Authority	Pragmatism
	X

4. NATURE OF TIME

Past Oriented	Present Oriented	Near Future Oriented
		X

Short Time Units	Medium Time Units	Long Time Units
	X	

5. NATURE OF HUMAN NATURE

Humans are basically evil	Humans are basically good
	X

Human nature is fixed	Human nature is mutable
	X

6. NATURE OF HUMAN RELATIONSHIPS

Groupisms	Individualism
	X

Authoritarian/paternalistic	Collegial/Participative
	X

7. SUB-CULTURE DIVERSITY/CONNECTEDNESS

Low	High
	X

* The X on each dimension indicates the ideal condition for high innovativeness.

TABLE 2

POSITIVE AND NEGATIVE INTERACTIONS BETWEEN I.T. AND CULTURE

I.T. VISION	THEORY X*	THEORY Y*
AUTOMATE	Negative	Positive
INFORMATE UP	Very negative	Positive
INFORMATE DOWN	Very negative	Very positive
TRANSFORM	Not feasible	Very positive

* Theory X is used here as shorthand for hierarchical, authoritarian control orientation, based on cynicism about human nature. Theory Y is used here as shorthand for idealism about human nature and a belief in collegial/participative relationships that permit high degrees of self-control.