Information Systems Management
in a Distributed World:
As Viewed within the
Broader Context of
Organizational Change

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Information Systems Management in a Distributed World:
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IS managers have long had to be adept at managing technological change. However, one key aspect of the IS function which has been the focus of much change is not simply technological but organizational: the level of centralization of IS activities. In this paper we briefly review the relative merits of centralized and decentralized systems and examine distributed systems as an effort to maintain the advantages of both approaches. We conclude that the way in which IS resources are distributed will change with changing technology, user needs, and user capabilities and that IS managers must become adept at managing ongoing change resulting from this redistribution. We then expand a model of managing organizational change in which the IS manager recognizes the act of balancing forces for and against change, builds forces for change, identifies sources of resistance to change, develops the change process, and stabilizes the changes.
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One of the most important areas in which managers need to develop expertise in is the management of change. Major organizational changes are happening more and more frequently, and they have become a matter of survival (Jick, 1990). Industries will look much different in the 80's and 90's and so also will functional divisions such as Information Systems (IS). IS managers must deal not only with technological transitions due to advances in information related technologies, but new management systems, changes which require the revision of managerial principles, assumptions, and practices (Kanter, 1987).

Centralization, Decentralization, and Distributed Systems

One key aspect of the IS function which has been the focus of much change is the level of centralization of IS activities. Following Ahituv and Neumann (1990), there are three basic approaches to the distribution of IS resources: centralized, decentralized, and distributed information systems. Each of these approaches has distinct advantages and direct implications for how IS is managed.

Centralized systems

The advantages of a centralized system primarily deal with economies of scale. For example, large, centralized systems reduce the need for multiple hardware, software, space, personnel, and data bases. These systems allow for better opportunities for recruiting qualified personnel and maintaining training programs. With such a system, management can maintain tight control over the information function activities in terms of standardization and security provisions. The coordination of development efforts and budgets under the guidance of an overall organization master plan is facilitated. Utilization of resources can be more efficient. Small or remote organization units can have access to a large repertoire of mainframe software usually not available on small independent systems.

A fully centralized Information System is not without its drawbacks, however. For example, Peters (1987) describes centralized IS as a situation in which the central IS fiefdom
functions as information hoarders for the sake of "consistency". This very consistency makes it extremely difficult to respond to the increasingly dynamic environment. Instead, centralized rules, authority, and power make it difficult to take innovative action due to the personal risk involved (Beer, Eisenstat, and Spector, 1990). A second problem is that the division of labor and increased functional specialization necessary in maintaining a huge centralized system comes at the expense of the capacity to see the "big picture" which complicates the problem of integration. Finally, probably the most important disadvantage might be that users are usually less satisfied and motivated because they are less involved and feel less responsible for application systems.

**Decentralized systems**

At the other end of the continuum are completely decentralized systems in which there is no central control over system development; no communication links among autonomous computing units; there exist stand-alone processing and databases in various sites; each autonomous unit funds its own information processing activities and is totally responsible for all development and operations. This kind of system offers a number of advantages. First, user motivation and satisfactions seem to be higher in a decentralized environment, possibly due to the fact that users have more responsibility and involvement in systems development and that systems are better attuned to specific user needs. In this environment users usually get better response times in routine operations as well as for specific requests for changes. Some advantages to the organization as a whole include the fact since users are directly responsible for the DP budget, demands tend to be more restrained. Finally, the costs for the physical and electronic transport of data are reduced and the risk of a total breakdown in information processing equipment is minimized.

Major disadvantages of a decentralized system center on the issues of control and coordination. Users tend to develop small, local "empires" and subsequently it becomes difficult to impose standardization, security measures, data sharing and professional knowledge. Under
this type of system it is difficult for managers to get integrated information and it is difficult for users outside of local databases to access those databases. For these reasons the duplication of data and applications development is likely. Together, these conditions frequently lead to diseconomies of scale involving redundant hardware, software, personnel, and other resources.

*Distributed systems*

The fact that both fully centralized and fully decentralized systems have disadvantages and advantages has lead to efforts to combine both approaches simultaneously. Thus, the issue seems not to be centralization or decentralization but to recognize that data processing is an organizational resource involving many activities each of which may be either centralized or decentralized. A working definition of a distributed information system might be one in which authority over one or more information system activities has been distributed, i.e., delegated.

There exists a wide variety of distributed systems, which vary along two dimensions: 1) how many activities are distributed; and 2) what is the degree of distribution of each distributed activity. Emery (1977) has suggested that the principle alternative structures of distributed processing may be arrayed on a continuum. At one end is *distributed processing with a central data base*. Under this system some processing takes place at local minicomputers (data entry and validation) but without the support of a local data base. Next is a *hierarchical system with local data bases*. This configuration describes a situation in which processing is done locally and the local data base is updated from local transactions and also, periodically, from the central data base. Summary data is sent to the central computer for global processing and central data base updating. A third type is a *distributed data base with limited sharing*. In addition to having local processing and a local data base, the local center can access other local data bases for low probability events (like verifying the balance for a bank customer wishing to cash a check at a branch other than their own). A fourth category is a *multiple level hierarchical distributed system*. Here any local processor of a distributed system is a central node of a lower-level distributed system. At the other end of the continuum is the *fully distributed network*. This type
is composed of multiple autonomous processes and partitioned data bases that have equal control status, i.e., a non-hierarchical structure without central control and with no single computer playing a central role. This arrangement permits resource sharing (primarily programs and data) among network sites by telecommunications.

Clearly the distributed model contains much of the positive side of both the centralized and decentralized models. It also has some of the flavor of Peters and Waterman's (1982) observation that successful organizations demonstrate "simultaneous loose-tight controls": some IS functions are controlled tightly while others are hardly controlled at all. A more critical piece of the puzzle is to recognize is that the way in which IS resources are distributed will change with changing technology, changing user needs, and changing user capabilities. Whereas decentralized and centralized systems carry with them a sense of a new order and clearly defined roles for IS, distributed systems do not. This means that the IS organization is in a relatively constant state of flux regarding which resources are closely kept in house and which are "given out" to the strategic business units. Thus, IS managers must become adept at managing ongoing change within their organizations.

Managing the Ongoing Transition

How can IS managers become adept at managing the transitions implicit in distributed systems? According to Kimberly and Quinn (1984) an organizational transition involves a major alteration in what an organization is trying to do and how it goes about doing it. The what component of organization change is the content aspect, while the how part is the process of change. In this section, we examine some of the key components that IS managers should become comfortable with the process of change. Our argument is that IS managers need to 1) recognize the act of balancing forces for and against change, 2) build forces for change, 3) identify sources of resistance to change, 4) develop the change process, and 5) stabilize the changes.
Recognize the balancing act

In general, we have to recognize change as essentially a modification of those forces which tend to keep an organization in equilibrium (Lewin, 1951). There are two sets of forces in any situation, driving forces which are pushing for a modification of the present situation, and restraining forces which are pushing toward the maintenance of the status quo. In order for an organization to change, the nature of the forces must be modified; either restraining forces reduced, driving forces increased, or a some combination of the two. For example a group may keep with an outmoded system due to the straining forces of fear of loosing one's expertise or control of the data balancing out management's drive to decrease customer response time.

One might implement change either by reducing the fear of losing control or by pushing harder for customer response time. Lewin argues that it is more effective in the long run to reduce resisting forces rather than to increase driving forces, since less tension and resistance are likely to be encountered. Thus, instead of pressing harder to justify the need for change and the benefits of change, IS managers may be better advised to focus on the sources of resistance to change. This implies that IS managers must become more aware of the reasons that change may be resisted and directly address these points of resistance rather than increasing the pressure for change.

Build forces for change

This action entails reducing those forces maintaining the organization's behavior at its present level. Unfreezing (Lewin, 1951) might be accomplished by introducing new information that clearly points out the discrepancy between desirable behavior in the organization and the level of behavior presently exhibited.

Managers can build forces for change by creating a readiness for change and creating a vision for the desired future state of the organization (Cummings & Huse, 1989). Together, they constitute both the push away from the present and the pull toward the future. In order for key decision makers in an organization to initiate change and push away from the present, high levels of dissatisfaction with current operating procedures must be felt (Cummings & Huse,
Motivation is a critical energizer of the change process, and must be developed to a high enough level to overcome organizational inertia that resists departing from the status quo. This dissatisfaction or disgust with the status quo can be triggered for example, by information revealing the discrepancy between desired financial effectiveness indicators and actual performance (externally driven) or this dissatisfaction might be internally driven due to high turnover or poor morale within the ranks.

The pull toward the future is produced by creating a vision of that future which is attractive to members who will inherit it. In order for the changees to acquiesce and to become accepting of the desired change, the IS manager needs to explicitly communicate a clear vision of the desired future state that the change will entail. This vision of the future organizational state needs to be fairly explicit with respect to the new behaviors, attitudes, structures, and systems needed (Beckhard and Harris, 1987; Kanter, 1984; Bennis and Nannus, 1985; Peters, 1987). The purpose of vision is to provide direction for change as well as serving as a standard or benchmark against which future progress toward change might be compared. Creating a vision is generally considered a major task of leadership for managers at all organizational levels (Bennis, 1985; Peters, 1987).

Identify the sources of resistance to change

Employee resistance to change can take many forms such as reduced output, increased turnover and requests for transfer, intentionally withholding important information, chronic quarrels and hostility, and artificially rationalized arguments concerning why the change won't work (Lawrence, 1954). Lawrence clearly argues that change can be effectively understood and managed only after a thorough understanding of the context of the normal social working relationship in place prior to the instigation of the change process. This is picked up again in the socio-technical literature which argues that change, to be understood, must consider the social side of the organization. That issues are rarely simply technical ones, but more often resistance is due to disruption of the social fabric of the organization. His major thesis is that technical
change (the *content* aspect, i.e., the substantive part of the change) is not resisted so much as the social aspects of the change (the *process* aspects, i.e., how the change is implemented vis a vis the normal social relations already existing in the particular situation). His argument is that when normal social relationships are disrupted, employees who are given little rationale for the change and are allowed little or no input into the formulation of the change process, will resist.

Recently, other authors (Kanter, 1984; Kotter & Schlesinger, 1979) have sought to develop the reasons for resistance to change more fully. In general, the following dimensions seem to be the most important for IS managers. First, changes in the distribution of IS resources may result in a perceived *loss of competence*. IS members or members accepting IS may be concerned about the new demands in terms of the ability, knowledge, and skills required to be effective in the changed situation. The fear experienced by those subject to the change with respect to their ability to develop the new skills and behavior required to be successful in the new changed situation may cause them to resist the proposed changes.

Changes in how the IS function is allocated can also induce resistance because of perceived *loss of power or status*. The political reality of most such changes is that there are likely to be winners and losers so that there is a real threat to power, status, and compensation of those members suffering a reduction in the centrality, importance, or visibility of their work. A related issue is that there may be a *loss of face* for some members of the organization. Here, members may resist change when accepting a change means admitting the old way of doing things was wrong. For example, moving IS functions out to the field can communicate that the centralized IS has not been performing adequately and that steps are being taken to take care of the deficiency.

Another source of resistance to change stems from perceptions of the *loss of personal control*. People resent surprises when decisions are made *fait accompli* with little warning or rationale for why the change is being implemented. Given the fact that the redistribution of IS resources involves a renegotiation of those resources among functional or divisional entities, people impacted by that change may feel that change is being imposed on them from the outside.
This can result in perceptions of being out of control and powerless. In addition, when employees don't have a clear idea of what to expect and the timetable of events they will experience a loss of control, causing them to resist the change. Related to the perception of the loss of control is the possibility of a lack of trust between those affected by the change and those orchestrating the change. This frequently occurs when the implications of the change are not clearly articulated. In addition, the issue of trust may concern past unresolved grievances. Individuals whose concerns have not been adequately dealt with in the past are likely to resist present pressures to change;

Finally, change may be resisted because of perceptions of an unfavorable cost/benefit ratio. For example, people who initiate change frequently make decisions based on different information than that used by individuals who are the targets of the change effort, although both parties believe they are operating with the same set of data. Most planned changes in organizations require more work for which individuals are frequently uncompensated for the additional effort expended. For example, members may be asked to support or even train those people who will be taking their responsibilities. In addition, change requires different behavior and a giving up and relinquishing of habitual past practices and behavior. Related to this is resistance stemming from a concern that the change is wrong. Circumstances do exist occasionally when those not initiating the change do indeed have information that is more accurate and pertinent for optimizing the change, and thus their resistance is healthy for the organization.

Develop the change process

Next, the IS manager needs to give explicit consideration to the change process. Lewin (1951) calls this moving, in which the behavior values, and attitude of the organization or department is shifted to a new level through changes in organizational structure and processes. In general, the choice of a change strategy involves first assessing interpersonal, political, and power factors related to the change process.
The first issue to consider is the source and magnitude of the resistance to the change that will be encountered. This involves the identification of who is likely to resist, and the relative status of the change agent with respect to trust, power, and the normal patterns of interacting (Kotter & Schlesinger, 1979). Both Kanter (1984) and Kotter and Schlesinger (1979) offer a number of strategies for the change process. Kanter has developed a number of practical recommendations which are included in the following Table.

Next, one must determine who might have information that is useful for designing and implementing the change (Kotter & Schlesinger, 1979). This step implies that information and support may be available in the either the IS or the host organization that should be drawn into the change process. In addition, it recognizes the very critical fact that the complexity of changes involving the distribution of IS resources mandate the input of multiple individuals along several steps of the change process.

Developing political support is the third part of developing the change process. This takes into account the fact that organizations involve powerful individuals who can choose to block or facilitate change (Cummings & Huse, 1989). It is important for change agents to be aware of this organizational reality and to proactively work toward gaining the support of powerful others (Kaplan, 1984). This activity involves determining one's sources of power, identifying key stakeholders in the change process, and developing and implementing strategies for gaining their support (Kanter, 1983). In particular, since IS distribution involves multiple stakeholders outside of the traditional hierarchical structure, building the necessary political support requires developing and exercising power laterally (Kaplan, 1984; Cohen & Bradford, 1990) as well.

Finally, IS managers need to examine how the change is to take place, i.e., the sequence of events, speeches, meetings, educational programs, personnel decisions, or other decisions designed to help employees as well as top management learn the new perspectives, skills, attitudes, and behaviors. These activities are geared to assisting individuals in adapting to and performing in the new change situation. Some of these activities might include the development
<table>
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<tr>
<th>Methods for Dealing with Resistance to Change</th>
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<tbody>
<tr>
<td><strong>Education and Communication</strong></td>
</tr>
<tr>
<td>* Commonly used: Where there is a lack of information or inaccurate information and analysis</td>
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<tr>
<td>* Advantages: Once persuaded, people will often help with the implementation of the change</td>
</tr>
<tr>
<td>* Disadvantages: Can be very time consuming if lots of people are involved</td>
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<tr>
<td><strong>Participation and Involvement</strong></td>
</tr>
<tr>
<td>* Commonly used: Where people who are resisting because of fear or adjustment problems</td>
</tr>
<tr>
<td>* Advantages: No other approach works as well with adjustment problems</td>
</tr>
<tr>
<td>* Disadvantages: Can be time consuming, expensive, and still fail</td>
</tr>
<tr>
<td><strong>Facilitation and Support</strong></td>
</tr>
<tr>
<td>* Commonly used: Where someone or some group will lose out and they have power to resist</td>
</tr>
<tr>
<td>* Advantages: Sometimes a relatively easy way to avoid major resistance</td>
</tr>
<tr>
<td>* Disadvantages: Can be too expensive in many cases if it alerts others to negotiate for compliance</td>
</tr>
<tr>
<td><strong>Negotiation and Agreement</strong></td>
</tr>
<tr>
<td>* Commonly used: Where initiators do not have all the information needed and others have considerable power to resist</td>
</tr>
<tr>
<td>* Advantages: People who participate will be committed to implementing the change, and information they have will be integrated into the plan</td>
</tr>
<tr>
<td>* Disadvantages: Can be very time consuming if participators design an inappropriate change</td>
</tr>
<tr>
<td><strong>Manipulation and Co-optation</strong></td>
</tr>
<tr>
<td>* Commonly used: Where the other tactics are infeasible</td>
</tr>
<tr>
<td>* Advantages: It can be a relatively quick and inexpensive solution to resistance problems</td>
</tr>
<tr>
<td>* Disadvantages: Can lead to future problems if people feel manipulated</td>
</tr>
<tr>
<td><strong>Explicit and Implicit Coercion</strong></td>
</tr>
<tr>
<td>* Commonly Used: When speed is essential and initiators possess considerable power</td>
</tr>
<tr>
<td>* Advantages: It is speedy, and can overcome any kind of resistance</td>
</tr>
<tr>
<td>* Disadvantages: Can be risky if it leaves people angry with initiators</td>
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and implementation of new training programs (for bringing technical as well as interpersonal skills up to par), replacement and/or transfer of individuals unwilling or unable to make the desired change, interdepartmental task forces that cut across different hierarchical levels, and problem solving groups. All of these may be considered broadly as vehicles for change.

Stabilize the changes

Any organized process of doing things carries with it a stability that is self-reinforcing, a stability that is disrupted by the change process. If the IS manager does not take steps to provide reinforcing structures or processes to the new way of doing things, there is a good change that the changes will not "take hold" but will eventually disappear or only be partially implemented.

This step can be called refreezing (Lewin, 1951) or sustaining the momentum for change (Cummings & Huse, 1989). This stage involves stabilizing the new behavior (or new state of equilibrium) by changing the underlying design of the organization in order to institutionalize the change. This is accomplished by using supporting mechanisms that reinforce the new state of the organization, such as culture, norms, policies, and structures. Four major steps are important to stabilizing change: providing adequate resources for change, building a support system for change agents, developing new skills and competencies for operating effectively in the changed environment, and modification of the reward system to reinforce new behaviors (Beer, 1980).

Conclusion

IS managers must deal not only with technological transitions due to advances in information related technologies, but new management systems, changes which require the revision of managerial principles, assumptions, and systems (Kanter, 1987). One key aspect of the IS function which has been the focus of much change is the level of centralization of IS activities. The distributed process model represents one way of allocating IS resources that attempts to take the best of both centralized and decentralized approaches. A more critical piece of the puzzle is to recognize is that the way in which IS resources are distributed will change
with changing technology, changing user needs, and changing user capabilities. This means that the IS organization is in a relatively constant state of flux regarding which resources are closely kept in house and which are "given out" to the strategic business units. Thus, IS managers must become adept at managing ongoing change within their organizations.

According to Kanter (1983) change is always a threat when it is done to me or thrust upon me. In those situations when I have a chance to play a significant role, change is perceived differently, since I now have a chance of being a hero. It is a chaotic, unpleasant process for everyone involved. It is only afterward when the major upheavals are over do we feel that change can be an exciting and fulfilling event. In closing, probably one of the most important things we can do is to prepare ourselves for the inevitability of change and to view it as a challenge to be understood and managed.
References


