

PERSPECTIVES ON THE EFFECTIVE USE, PLANNING,
AND IMPACT OF INFORMATION TECHNOLOGY

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INTEGRATING INFORMATION TECHNOLOGY INTO CORPORATE STRATEGY

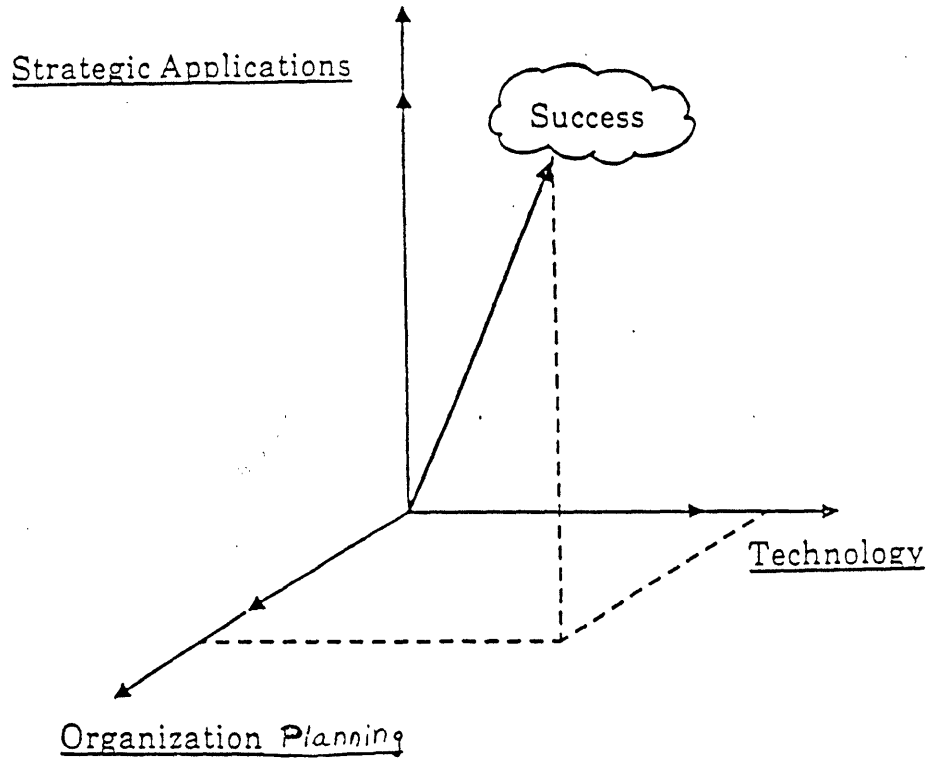
Information technology (IT) has moved demonstrably into the limelight as a major force to be reckoned with in corporate America. Offering promises of "competitive advantage" to those that exploit "strategic computing," examples can be found cited in all the major business publications. One of the earliest, and now classic, examples is American Hospital Supply [1]:

American Hospital Supply (AHS), a leading manufacturer and distributor of a broad line of products for doctors, laboratories, and hospitals, has since 1976 evolved an order-entry distribution system that directly links the majority of its customers to AHS computers. Over 4,000 customer terminals at various locations are linked today to the American Hospital Supply system. As well as providing the customer with direct access to the AHS order-distribution process, the system allows customers to perform functions, such as inventory control, for themselves, thereby generating incremental revenues for AHS. The American Hospital Supply system has been successful because it simplifies ordering processes for customers, reduces costs for both AHS and the customer, and allows AHS to develop and manage pricing incentives to the customer across all product lines. As a result, customer loyalty is high, and AHS market share has been increasing.

In seeking success for the corporation through information technology, there are three factors that must be considered (see Figure 1 [2]). Obviously, an understanding of strategic applications and information technology is critical. But, a third, and oft overlooked, critical dimension is the need to plan the organizational changes necessary if strategic applications

using information technology are to succeed. This planning activity is the focus of this paper.

Figure 1
Factors critical to success



Framework for Integrating IT into Corporate Strategy

Top management needs a framework to understand how to integrate information technology into its corporate structure and an action plan to seize the opportunities made possible.

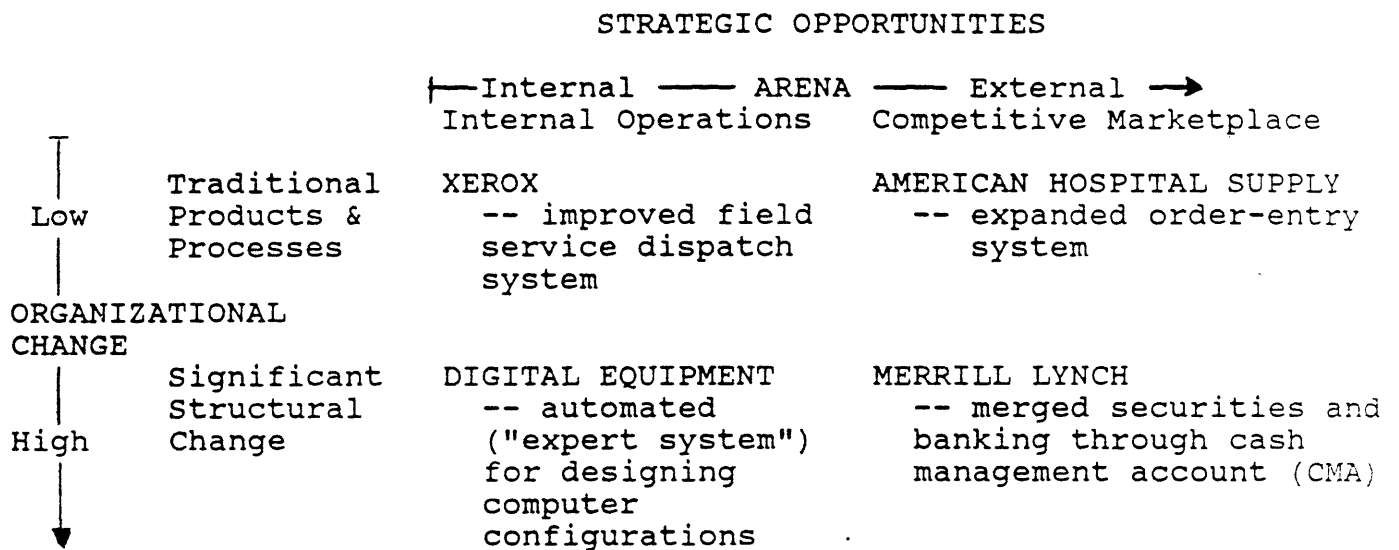
A starting point for such a framework is found in Michael Porter's work on competitive strategy [3,4]. He suggests that, for any company, significant strategic actions consist of diminishing supplier or customer power, holding off new entrants into its industry, lowering the possibility of substitution for its products, or gaining a competitive edge within the existing

industry.

All four elements of Porter's strategy appear in the American Hospital Supply case. This generic framework can be extended in various ways to focus on information technology more directly.

The strategic opportunities matrix in Figure 2 [1] provides a simple, but powerful, way of thinking about the strategic use of IT.

Figure 2
Strategic Opportunities Matrix



The opportunities arena may occur in internal operations within the corporation, such as Xerox's improved service-dispatch system, or in external relationships with customers and/or suppliers, as in the American Hospital Supply order-entry system. Furthermore, the organizational change brought about or facilitated by the IT may be fairly low, as in case of Xerox and American Hospital Supply, or it may be significant, as in Digital's restructuring of its computer configuration-design process or in Merrill Lynch's expanded role into many banking services through its cash management account (CMA).

Positioning IT in the Organization

Technological myopia can stifle an organization's ability to seize new opportunities. John Wyman [5] notes the importance of top management positioning. He cites a survey of the organizational level and role of the top IT position that reflects the corporation's attitude toward information technology (see Figure 3).

Figure 3
Strategic Positioning Matrix

High ↑	Full Sample -----	+\$500M Sales -----	Top IS Position -----	Planning Role -----	Attitude -----
	8%	17%	CIO	Strategic	Priority
	27%	30%	VP, MIS	Tactical	Necessary Investment
	27%	17%	Dir, MIS	Operational	Necessary Expense
↓ Low	38%	36%	Mgr, DP (or TP,OA)	Budgeting	Expense to Control

At the lowest tier in this matrix, data processing (DP), office automation (OA), and telecommunications (TP) are perceived as three separate islands, each with its own manager and budget. The firm sees these three distinct functions as expenses in need of control.

In contrast, at the highest level, the management of what is now integrated technology, moves to the senior officer level -- a chief information officer (CIO), a counterpart of the chief financial officer. Here, the planning task is to develop the firm's strategic use of information technology. When information is viewed in this context it becomes very valuable, something to

be treated as a priority investment equal in importance to labor or capital. Wyman reported that the larger organizations, those with over \$500 million in sales, were twice as likely to have established already a CIO position compared with the smaller organizations surveyed.

Matching IT to the Organization's Corporate Strategy

It is not sufficient merely to identify strategic opportunities and establish a supportive organizational structure. It is important that the information technology strategy selected match the organization's strategic posture as well. Three dimensions of such a strategy are identified by John C. Camillus and Albert L. Lederer [6]:

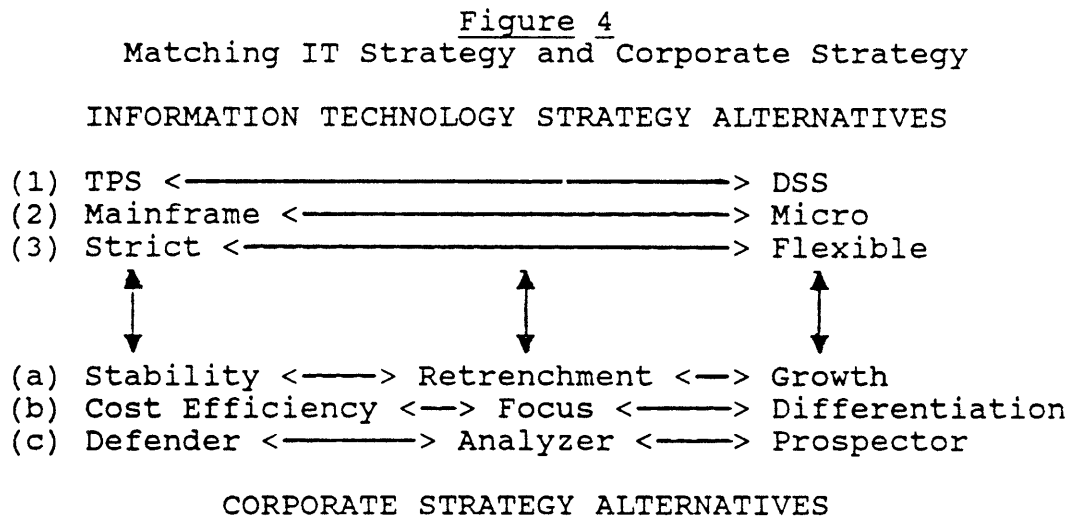
(1) Transaction Processing Systems (TPS) vs. Decision Support Systems (DSS): A TPS is a system set up to process large numbers of transactions efficiently and accurately (e.g., an order-entry or reservation system). A DSS is intended to aid managerial decision making. Although the TPS-DSS choice actually represents a continuum, the TPS is inherently oriented toward programmed decisions; DSS, on the other hand, is more appropriate for semistructured problems and nonprogrammed decisions.

(2) Mainframe vs. Independent Microcomputers: A large-scale mainframe computer can provide a high-performance centralized data-base capability, such as may be needed for an airline reservation system. Independent microcomputers, on the other hand, may be appropriate in a consulting

organization where each specialist has very different data and analysis needs.

(3) Strict vs. Flexible: The policies for hardware acquisition, data control, staffing, etc., may be either strict or flexible. Where efficient execution of a clearly defined strategy is important, a comprehensive and strict set of policies is probably warranted. A flexible approach to these policies would promote creativity, independence, and adaptive behavior.

These three dimensions are independent and an organization could select a separate position on each; however, matching these information technology strategies with corporate strategies leads to certain likely relationships, as suggested in Figure 4 [6]. In this figure the key elements of strategy alternatives proposed by Glueck (a) [7], Porter (b) [3], and Miles and Snow (c) [8] are depicted.



A stability (a), cost-efficiency (b), or defender (c) stance mandates an orientation that can enhance profits without an increase in volume of activity -- suggesting a TPS mainframe

information technology with strict policies. On the other hand, a growth (a), differentiation (b), or prospector (c) corporate strategy might be best accomplished by a flexible orientation utilizing micros with DSS capabilities.

Each situation, of course, must be examined separately, but this framework helps to structure the evaluation process. The important point is that an explicit matching be done between corporate strategy and IT strategy.

Control of IT

The previous section noted the importance of matching the corporate and the IT strategies. There are various ways of accomplishing this goal, ranging from very informal to fully integrated corporate/IT strategy planning. Henry C. Lucas and Jon Turner [9] suggest the alternatives listed in Table 1.

Table 1
Integration of Information Technology
and Corporate Strategies

<u>Level of Integration</u>	<u>Primary Objective</u>	<u>Secondary Objective</u>
I. Independent	Operational efficiency	Managerial information
II. Policy support	Aid decision making	Understand problem dynamics
III. Fully integrated	Open new products, markets, directions	Change decision process, consider alternatives

In the independent situation, information systems are not linked to any corporate strategy other than to perform their tasks with operational efficiency; this corresponds to most traditional payroll, inventory, and order-entry systems. In the

policy-support situation, IT is used to help develop corporate strategy, for instance, by producing sales forecasts and testing assumptions during the planning process.

Explicit control of IT and full integration into corporate strategy formulation are necessary prerequisites to the successful exploitation of IT strategic opportunities. In extreme cases, IT strategy is the corporate strategy, as illustrated by the following case [9]:

Information Resources, Inc. developed a corporate strategy that is intertwined with information technology. The firm purchased grocery-store point-of-sale scanning equipment and gave it free to fifteen supermarkets in two towns, selected on the basis of their demographic makeup. There were 2,000 households in each of the two test markets using the scanning equipment: their purchases were recorded on an Information Resources computer in Chicago. Since each product was marked by the universal product code, researchers could pinpoint a family's purchases by price, brand, and size and then correlate the purchase information with any promotions, such as coupons, free samples, price adjustments, advertising, and store displays.

This technology means that Information Resources can conduct economical scientific tests of marketing strategies to determine the most effective approach for its customers. For example, through cooperation with a cable TV network, the firm can target different TV spots to selected households and analyze the resulting purchases. The imaginative use of this technology, in fact, allowed the firm to gain a competitive lead over larger, better established market research firms.

Assuming that one is appropriately motivated to want to seize such strategic advantages, how does one structure the corporation's information systems organization and develop a process for planning for this new era of information technology? These issues are addressed in the next section.

PLANNING FOR THE NEW ERA OF INFORMATION TECHNOLOGY

Role of the Chief Information Officer

The role of the top information systems executive is fundamentally changing from the "technical" orientation of the 1960s and 1970s to a "managerial" orientation for the 1980s and 1990s. But how does the IS executive develop this managerial orientation, focus energy and efforts, and develop effective relationships with peer executives?

A powerful tool for helping to identify ways of meeting these needs is the Critical Success Factors (CSF) methodology developed by John F. Rockart [10, 11]. CSFs help identify those few key areas of activity in which favorable results are absolutely necessary for a particular manager to reach his or her goal. In a survey of nine major companies that generally were regarded as outstanding in their use of information technology [10], the CSFs of the top IS executives were elicited and summarized into the following four key CSFs: service, communication, IS human resources, and repositioning the IS function.

A general profile of successful IS executives emerged from this study. These executives see their role as general business managers, not as information systems technicians. They also see the information systems function as very significant to the success of the company -- and they are constantly communicating this perspective to others. Each IS executive interviewed had a crisp, clear view of his or her own critical success factors. In short, all had well-defined perspectives on IS technology and a

clear vision of where their corporations should be going with that technology.

Finally, almost all of the executives interviewed spoke of their organizations from a "political" perspective as well as from a "rational" one. Emphasis was often placed on the need to get key "power" individuals to understand and act in ways beneficial to the organization. The use of the CSF methodology is an effective tool for both accomplishing this goal and starting the planning for the exploitation of information technology within the firm.

An Assessment of Critical Success Factors for Planning

Originally the CSF procedure, which involved interviews between an analyst and a CEO, was intended to identify critical areas of concern for that executive and to provide initial descriptions of information measures that reflect these critical needs. Subsequently Bullen and Rockart [12] broadened the definition of CSFs and proposed that they be used as an MIS planning tool. When used in this way, managers from multiple levels of an organization's hierarchy must be interviewed and the resulting CSFs are synthesized into a collective set for the entire organization.

A number of organizations have employed CSFs successfully in these ways. Andrew C. Boynton and Robert W. Zmud [13] conducted a study to determine the strengths and weaknesses of the CSF methodology as applied to MIS planning and requirements analysis. They suggest that the CSF method has two key strengths that make it successful. First, it generates user acceptance at the

senior-manager level. Senior managers intuitively understand the thrust of the method, and consequently they strongly endorse its application as a means of identifying important areas that need attention. Second, the CSF method facilitates a structured, top-down analysis or planning process. It initially focuses a participant's attention on a core set of essential issues and then proceeds to refine the issues in a manner that allows an evolving design to be examined continuously for validity and completeness.

In strategic planning, CSFs form a bridge between corporate strategic interests and strategic planning efforts of the information function. Since an organization's CSFs are those factors that must go well for the organization to succeed, a link is provided between an organization's tactical and strategic planning objectives.

In their study of CSF effectiveness, Boynton and Zmud did find that the more removed managers and other personnel were from the senior management level, the more difficult it became to develop meaningful corporatewide CSFs. They categorized their findings about critical success factors into strengths and weaknesses (see Table 2).

Table 2
Strengths and Weaknesses of CSF Method

STRENGTHS:

- . Provide effective support to planning processes.
- . Develop insights into information services that can impact firm's competitive position.
- . Are received enthusiastically by senior management who identify with the thrust of the CSF concept.
- . Serve as the top level of a structured analysis and promote structured analysis process.

WEAKNESSES:

- . The more removed managers are from senior positions within the organization, the more difficult it is for them to identify meaningful organizational CSFs.
- . Managers not involved with strategic and tactical planning can experience difficulty in dealing with the conceptual nature of CSFs.
- . It is difficult for certain managers to ascertain their information needs using only CSFs.

By understanding these strengths and weaknesses, the CSF method can be effectively applied to help a corporation perform strategic information technology planning.

Top Management Participation

As the previous discussions indicated, active top-management participation, direction, and support are crucial to the strategic use of information technology. There are many ways to accomplish this, John F. Rockart and Adam D. Crescenzi [14] propose a three-phase process:

- I. Critical Success Factors
- II. Decision Scenarios
- III. Prototyping

The use of critical success factor analysis in Phase I not only provides the linkage between business strategy and information technology, but it also establishes the active top-management participation needed to carry through with Phases II

and III.

The decision scenerios explored in Phase II have two major goals: to develop systems priorities and to gain managerial confidence that the systems priorities will support the corporation's key objectives.

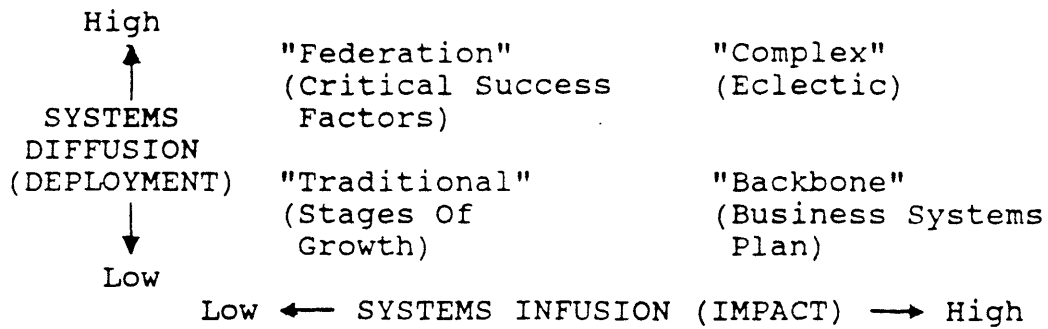
Phase III involves creating prototypes and implementing actual systems. A prototype provides enormous benefits by reducing monetary risk, reducing business risk, and allowing a manager to inspect, work with, and actively participate in the development of the system.

Portfolio of Systems Planning Methodologies

A variety of systems planning methodologies has been proposed over the years. Each can serve an important role depending upon the circumstances. Two important factors are infusion and diffusion. Infusion refers to the degree of penetration of information technology into the organization, usually with a focus on decreasing costs and/or increasing revenues. Diffusion refers to how widely the information technology is decentralized and disseminated.

Using these two dimensions, Cornelius H. Sullivan, Jr. [15] identifies four planning environments and the most promising methodology for each (see Figure 5).

Figure 5
Technology Planning Environments



The Stages of Growth (SOG) method, first proposed almost twenty years ago, suggests that the changes introduced by IT must be assimilated by organizations through a predictable sequence of stages, starting with initiation and expansion, followed by consolidation and maturity. This situation is rapidly being changed by increasing infusion and diffusion, but it remains viable and appropriate in "traditional" environments with low infusion and diffusion.

The Business Systems Plan (BSP), developed by IBM, focuses on conceptualizing and designing the overall corporate data resource. This approach works well in a "backbone" environment where computing is strategic to the company, yet it is still centralized in the manner of its deployment and operated in a manner analagous to a factory.

The Critical Success Factor (CSF) approach, because of its ability to be customized to individual executives and departments, is ideal in the environment in which technology is to be distributed among communicating "federations".

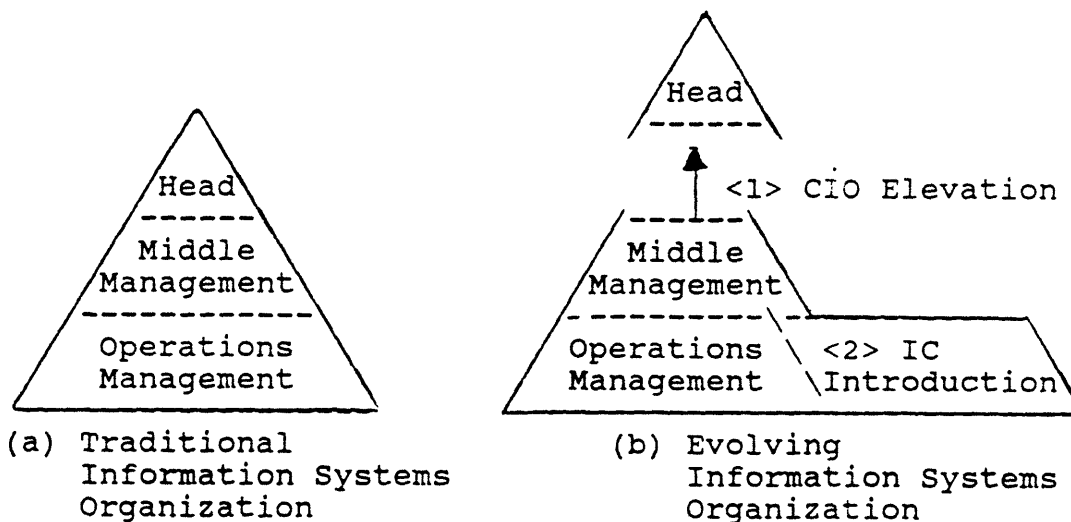
No single method appears to dominate in the complex environment of high diffusion and high infusion. Thus, many complex corporations draw upon these three methods to develop

their own unique eclectic approaches, often incorporating additional factors, such as data-resource management, network-resource management, and new organizational designs.

Pressures on the Information Systems Organization

There are two important forces at work in most information systems organizations that must be realized and addressed. The traditional information systems organization, depicted in Figure 6(a), could be divided into three levels of management hierarchy: the head of IS, the middle-level IS management, and the IS operations management. This organizational structure is evolving through the <1> the elevation of the CIO and <2> the introduction of information centers (IC), as depicted in Figure 6(b).

Figure 6
Pressures on the Information Systems Organization



In other words, as information technology has taken on an increasingly important strategic role, the head of Information Systems, increasingly being called the chief information officer (CIO), has been elevated in the organization's hierarchy. As

early as the Fall of 1984 the CIO function was identified in 30 percent of the Fortune 100 companies surveyed [17]. This elevation, however, not only raises expectations, but also produces disappointment, especially if the lower levels of an IS organization hierarchy continue to operate as if no change had occurred.

Another major change has grown out of the information center (IC) concept. Conceived by IBM Canada in 1976, this concept envisages an organization that supports technology for end users. In a 1983 study by the Diebold Group of New York, noted in [16], over 66 percent of the companies surveyed had introduced information centers. Today, these information centers provide end users with increased self-sufficiency and productivity aids, thereby reducing the amount of traditional IS resources needed.

The information center's predominant focus has been on the use of technology, usually without explicitly addressing the management of technology. Thus, the operational level of the IS hierarchy has broader responsibilities for supporting new technologies -- yet often without corresponding management adjustments.

The combination of CIO elevation and information center introduction is leading to disruptions within many IS organizations. What is needed is recognition of these forces and adjustments to the organization to support the CIO's new role and to manage the technology. An example of such a structure has been proposed by Darrell E. Owen [16].

Besides the internal concerns, such as the IS organization's structure, a corporation must also be cognizant of the

environment in which it exists and its responsibilities to the employees of the organization and to society. Specific examples of these issues are highlighted in the next section.

RESPONSIBILITIES TO THE ORGANIZATION AND SOCIETY

The pervasive and critical role of information technology necessitates certain responsibilities to customers, the organization, the industry, and society at large. As John F. Akers, President of IBM, states [18], "if we don't conduct ourselves responsibly, governments and other institutions will erect barriers that could restrain our growth and limit the effectiveness of our industry."

One particularly important area to consider is managerial security -- that is, the policies and procedures adopted by management to determine authorization and to ensure the security of their data and the computer installation against unauthorized access or modification.

A framework to categorize management policies and procedures has been developed by Madnick [19]. This article identifies four primary areas: organizational considerations, organizational impact, economics, and objectives and accountability. Accountability warrants special attention since assignment of accountability is often not explicitly performed or monitored.

Philip Adler, Jr., Charles K. Parsons, and Scott B. Zolke [20] address these issues in the context of personnel administration. Their research identified specific management implications and concludes with the development of a four-step

proposal:

1. Develop a formal practices plan
2. Encourage active employee involvement
3. Accumulate only relevant and recent data
4. Carefully control and monitor release to the outside

Although externally developed social, legal, and technical factors may influence or constrain options, primary decisions continue to be based on internal management decisions. As our reliance upon information technology continues to heighten and propel us toward an ever more comprehensive "information society," these issues will become increasingly critical.

CONCLUSIONS

Corporations stand at the threshold of a new age. Confronted with worldwide turbulence and competition, information technology is the new weapon that is capable of dramatically changing the balance of power. An effective battle plan and the ability to mobilize resources are essential. This paper has presented the steps needed to integrate IT into the corporate strategy, plan the changes to the organization, and be alert to the impact upon society at large.

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