KEY CONCERNS OF EXECUTIVES MAKING IS DECISIONS

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ABSTRACT   Inquiry of the nature of other information system (IS) executives' concerns can provide insight for IS decision makers to develop new IS infrastructures, and to position their organization strategically. This paper reports the results of a study of several hundred executives making IS decisions.

The study indicates that IS executives are focusing their attention on emerging technologies (such as networking, connectivity, and voice/data) with strategic implications. Meanwhile, as organizations evolve, the executives' focus moves from structured operational and computational concerns, such as backlog and security, within the organization to unstructured temporal and strategic issues in the environment.

These results further suggest a three-phase process where networking (phase 1) provides the backbone structure for the connectivity of diverse, and often incompatible, systems (phase 2) which in turn makes available opportunities for strategic computing (phase 3).

1   Introduction

"My job is to provide an effective and efficient delivery system to meet the corporate information needs," says the executive vice president of a major service company. "The service company was reorganized in 1986 to achieve synergistic results, primarily through *centralization* including central sites host computers, local and remote *networks*, *voice and data* communications, office systems, and *departmental computing. Performance* (capacity, response, reliability, availability) and *security* are crucial to the successful achievement of the results, as is the *introduction of new technology*. Our IS organization is being viewed as non-responsive due to (1) large *backlog*, (2) unclear role/responsibility of IS vs. users, and (3) micro computers which cannot *connect* to our mainframe. We need to know what options are effective for the future *deployment of our resources*, for the expedient implementation of those deployment, and for the *strategic* capitalization of market-driven opportunities."

In effect, this executive vice president was expressing the thoughts of many other executives who are responsible for making information systems (IS) decisions. In recent years, significant advances in the computer and telecommunication industries have created a wide range of opportunities for business applications. The price, speed-performance, capacity, and capabilities of new information technologies continue to improve rapidly, and there appears to be unlimited IS potential that can be exploited to meet corporate information needs and to realize the opportunities.

As quoted above, these concerns span a wide array of issues. The capability to clearly understand, prioritize, and predict major IS issues will help executives to focus attention and energy in making difficult decisions about the commitment of their limited resources that will result in a higher return on investment in the ever more innovative and competitive information era. However, a widely accepted and current assessment of the important IS issues may not be easy.

It is worth noting that oftentimes it is the less obvious issues that become the biggest concerns over time. For example, five years before the personal computer emerged as a major force for facilitating end-user computing, there was little discussion of awareness of its potential impact [Dickson et. al. 1984]. With the restructuring of the communication industry, some companies have seen attractive new options [Clemons and McFarlan 1986]. In effect, the innovative technologies of communications and computers seem to increasingly redefine the competitive game for companies of all sizes.

Are executives concerned about emerging technologies in formulating strategies? How are they related to other IS issues? To answer these questions, the authors examined the literature and interviewed (over a period of nine months) key executives making IS decisions.

2   Key Executives' IS Concerns

Issues that surfaced from the interviews, such as those cited by the executive vice president earlier, can be grouped into four clusters of IS concerns:

1) inter- and intra-organizational computing (such as networking, connectivity of diverse systems, and strategic computing),

2) management of change (such as introduction of new technology, deployment of resources, and voice/data integration),

3) distributed processing (such as performance, centralization vs. decentralization, and departmental computing), and
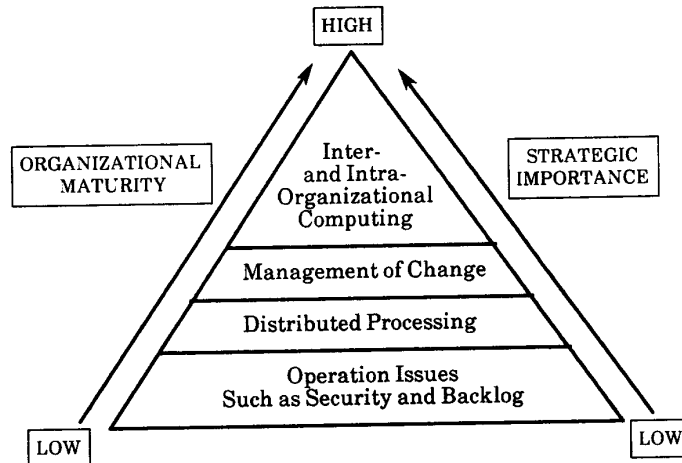
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Figure 1   Functional Relationship of IS Concerns

4) operational issues (such as security and backlog).

Figure 1 suggests a functional relationship of the four clusters of concerns: as organizations evolve, the executives' focus moves upward from the basic operational and computational concerns within the organization to critical temporal and strategic issues in the environment.

Based on these interviews, a questionaire was designed to rank the importance of key subtopics in each cluster, and data were collected from over three hundred executives. As summarized in Table 1, the statistics support the clustering of issues surfaced in the initial study. Moreover, inter and intra organizational computing subtopics received the highest rankings.

Correlations were calculated for the key subtopics, and significance of these correlations were tested [Sachs, 1984], as shown in Figure 2. A large circle indicates that the correlation is significant beyond 99.99% level of confidence, a medium circle for 99.9%, and a small circle for 99%. The implications of the rankings and correlations are discussed in the following sections.

2.1 Inter/Intra-Organiztional Computing

Of most importance to the executives interviewed are inter- and intra-organizational computing topics, specifically networking, connectivity, and strategic computing.

"There is an opportunity for us to save money by sharing a common network," says a manager in charge of program planning and management service. "Our company is decentralized. Businesses are diverse and linked only for corporate requirements (financial consolidation, personal systems planning). Presently, we have four major data centers with each data center having separate telecommunication networks. Cost of communication and the fact that each business uses data communications network that often 'cross one another' leads us ever closer to a 'corporate network.'

The cultural implications and management challenge of such a network seem overwhelming."

"The issues surrounding networking have become increasingly more diverse with the proliferation of network strategies and the offerings now available," says the director of the computing services and communication systems of a major retail chain. "It is most difficult to determine which standard will be established and adopted. Given our requirement for a communication network spanning some 1400 business units, 25 remote distributed input centers as well as international and domestic data centers, it is difficult to select the appropriate connection media which remains cost effective for the technologies installed at each location."

"Connectivity and networking are very important to support our new divisional organization, and to help our divisions expand into new, non-aerospace products and markets," says the vice president who is in charge of the information resource management function of a major aerospace corporation.

"Optimal utilization of corporate hardware and application assets in a multi-vendor, typically incompatible, environment is critical to the company," says the CIO of a major financial corporation. "Without connectivity of diverse systems via network integration, the strategic information to run our business cannot be accessed or delivered to all personnel within the company. We are reviewing a number of operational opinions from various information management driven companies."

"Strategic computing involves future technology directions, sophisticated networking and telecommunication, utilizing large, centralized database environment, and effectively investments in hardware," says the director of a health care institute. "It is a powerful weapon in gaining and keeping a competitive edge over our health care competition. Our organization uses IS technology to link hospitals, clinics, physicians, nursing homes, and other affiliates together to form the complete

Table 1: List of Issues By Executives Making IS Decisions

CLUSTERS OF ISSUES		MEAN	SD	MED	FIRST QUART	THIRD QUART	% AS TOP CONCERNS
I. INTER AND INTRA ORGANIZATIONAL COMPUTING							
I.1	Networking	8.57	1.78	9.00	8.00	10.00	42.63
I.2	Connectivity of Diverse Systems	8.25	2.10	9.00	7.50	10.00	39.18
I.3	Strategic Computing	7.91	2.12	8.00	7.00	10.00	29.15
II. MANAGEMENT OF CHANGE							
II.1	Introdution of New Technology	7.98	1.75	8.00	7.00	9.00	24.13
II.2	Resources Deployment	7.57	2.05	8.00	6.00	9.00	20.38
II.3	Voice/Data Integration	7.07	2.34	7.00	6.00	9.00	16.61
III. DISTRIBUTED PROCESSING							
III.1	Performance	7.24	2.12	8.00	6.00	9.00	17.87
III.2	Centralization & Decentration	6.87	2.38	7.00	5.00	9.00	15.36
III.3	Departmental Computing	6.80	2.27	7.00	5.00	9.00	13.17
IV. OPERATIONAL ISSUES							
IV.1	Security	6.28	2.29	6.00	5.00	8.00	0.72
IV.2	Backlog	5.72	2.34	6.00	4.00	7.00	0.53

MEAN: Mean value (10 = extremely important, 1 = don't care)
SD: Standard deviation of rank scores
MED: Median value of rank scores
FIRST QUART: First quartile; THIRD QUART: Third quartile
% AS TOP: % who rank the issue as most important (Note: may total more than 100% due to ties for top rating by some executives)

family of health care providers and products."

Networking, connectivity, and strategic computing using telecommunication technologies have become topical issues [Clemons and McFarlan, 1986; EDP Analyzer, 1986; Porter and Millar, 1985; Cash and McLeod, 1985; Cash and Konsynski, 1985; McFarlan, 1984]. McFarlan [1984] showed how companies could deploy their IS resources to implement competitive strategies as defined by Porter. Porter and Millar [1985] found that information technology is changing the rules of competition in the following three ways: 1) changing the industry structure; 2) creating competitive advantage; and 3) spawning completely new businesses. Our study confirms that these issues are at the forefront of executives concerns.

43% of the executives cited networking as the top concern facing their organizations with a mean rating of importance of 8.57 on a 10-point scale as shown in Table 1. 39% mentioned connectivity as the top concern, with a mean of 8.25. 29% of the executives cited strategic computing as the top concern with a mean of 7.91. Moreover, the correlation between networking and connectivity is statistically significant. In Figure 3 we suggest a likely evolution of inter and intra organizational computing. Networking (phase 1) provides the necessary backbone structure for the connectivity of diverse, often incompatible, systems (phase 2) which in term makes available opportunities for strategic computing (phase 3).
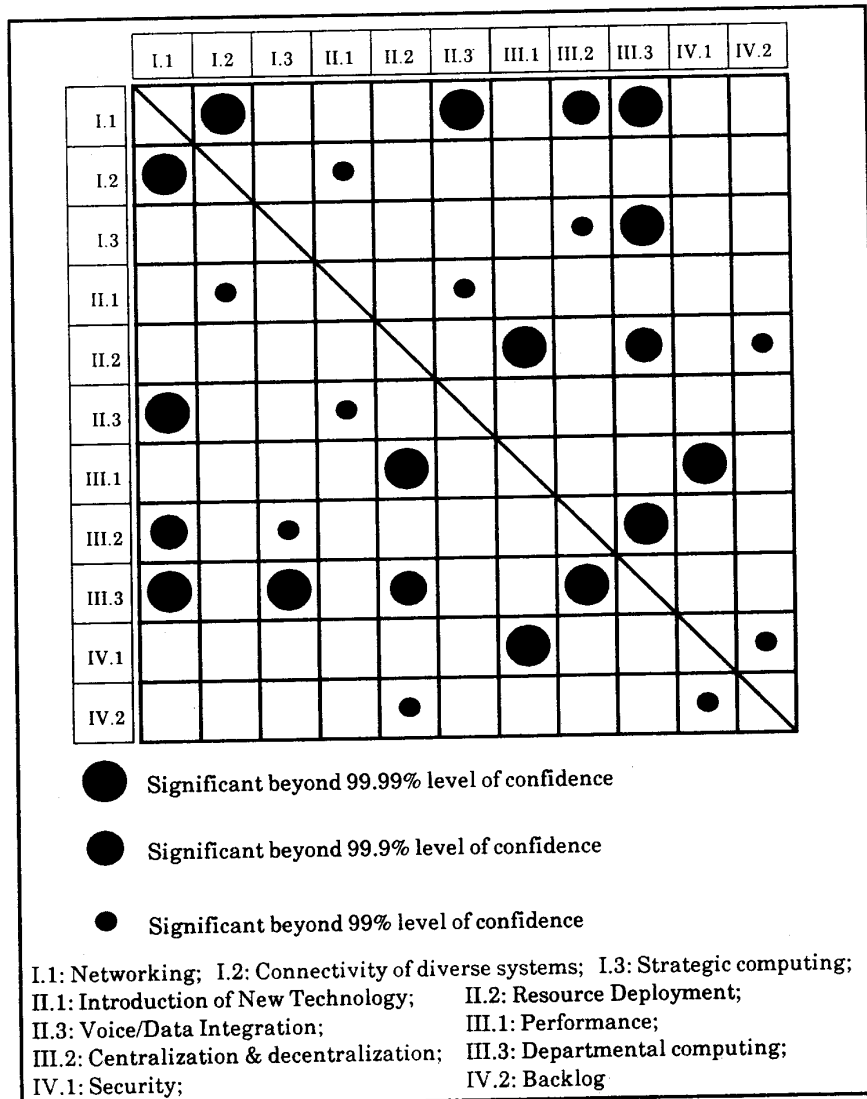
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Significant beyond 99.99% level of confidence

Significant beyond 99.9% level of confidence

Significant beyond 99% level of confidence

I.1: Networking; I.2: Connectivity of diverse systems; I.3: Strategic computing;
II.1: Introduction of New Technology; II.2: Resource Deployment;
II.3: Voice/Data Integration; III.1: Performance;
III.2: Centralization & decentralization; III.3: Departmental computing;
IV.1: Security; IV.2: Backlog

Figure 2   Matrix of Significant Correlations Among Subtopics

From the perspective of Figure 3, our study indicates that most of the executives surveyed are at phase 1 and view networking as most critical currently, though connectivity and strategic computing are also viewed as extremely important. Two plausible reasons for the relative importance of networking are as follows: (1) it is a necessary prerequisite for the connectivity needed for many strategic applications, and also (2) it can provide other advantages such as reducing redundant communication costs, consolidating hardware usage, and facilitating many operational requirements, such as convenient terminal access to remote systems.

As the backbone network structure settles in, an increasing number of these executives will likely address connectivity and strategic computing issues more vigorously. Although there is a high correlation between networking and connectivity shown in this study, the role of networking and connectivity in relation to strategic computing is not consistently understood by these executives as evidenced by the correlations depicted in Figure 2. This may be because some executives envisage a direct progression from networking (phase 1) to strategic computing (phase 3), whereas others explicitly understand and see benefits in the intermediate requirement for connectivity (phase 2) which facilitates not only many strategic applications but

Value-Added

Competitive
Advantage

Strategic
Computing

Coordination
Among
Systems

Connectivity

Other Applications,
e.g., consolidate
payroll and
personnel data

Backbone
Communication
Structure

Networking

Other Applications,
e.g., terminal access
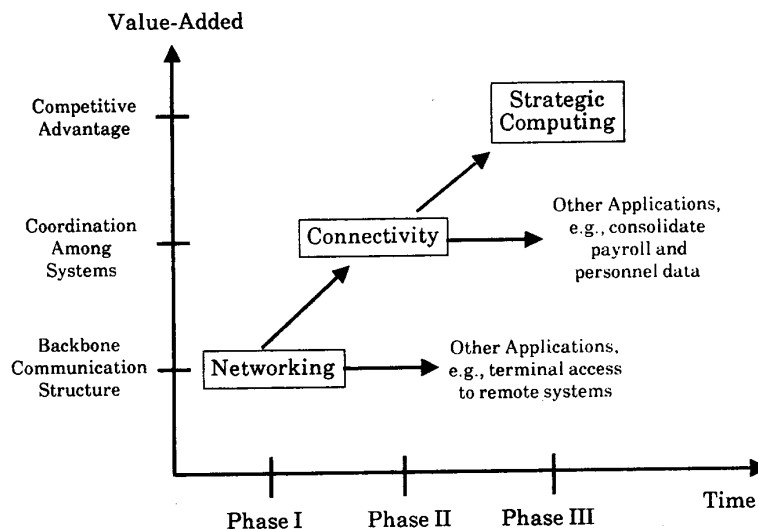to remote systems

Phase I   Phase II   Phase III

Time

Figure 3   Evolution of Inter- and Intra-Organizational Computing

also enhances many operational applications, such as consolidated payroll and personnel data.

It is prognosticated that the next decade will witness a significant deployment of inter and intra organizational computing in corporate America evolving from networking, connectivity of diverse incompatible systems, to strategic computing.

2.2   Management of change

Management of change (such as introduction of new technology, effective deployment of resources, and integration of voice and data) is also crucial to the survival of many organizations.

"In terms of function, our systems are among the richest available," says the senior vice preseident of information services division of a major midwest bank. "However, those systems are technologically deficient -- the majority of the systems were developed prior to 1970. Because of industry wide trends and local competition, it is critical to develop a new integrated deposit system employing the latest technology based techniques and tools. One of the key side effects of this undertaking will be the rapid propagation of new technology throughout the division."

"Development of resources is a very timely question," says the division manager of network engineering of a major telecommunication company. "Configuration of computers for optimum results in our organization consists of five separate systems interconnected by LANs. Also there is joint use of terminals for emerging CAD/CAE systems and other purposes. We have limited investment now, but we must make major commitments soon on the corporate resources which will impact the organization for years. Deployment of resources expands organizational responsibility."

"Technology is in place for universal voice/data connectivity," says the director of communication information techology services at a leading university in California which has just installed a new $21M telecom system. "We are working hard to effectively exploit this foundation in the context of individual group, department, and institutional productivity. The endeavor will provide a new infrastructure for the university to keep its leadership."

24% of the executives interviewed ranked introduction of new technology as the top concern facing their organizations with a mean of 7.98, and 20% for resources deployment with a mean of 7.57, 18% ranked voice/data integration as the top concern with a mean of 7.1. In addition, significant correlations exist between introduction of new technology and networking, connectivity, and voice/data, suggesting that they are viewed as specific instances of new technologies. The correlation between voice/data integration and networking is also significant, indicating the consensus that voice/data goes with networking.

Many MIS/DP organizations mentioned management of change as a critical success factor which involves long range technological planning to make it as non-disruptive as possible [Martin, 1982]. McFarlan [1984] suggested that, "in many cases, introduction of new IS technologies has opened up a singular, one-time opportunity for a company to redeploy its assets and rethink its strategy. The technology has given the organization the potential for forging sharp new tools that can produce lasting gains in market share."

In sum, many forms of technology are being introduced by numerous vendors. Yemini and Misholi [1983] suggested that the integration of voice with 'the digital world' is occurring at the transmission, communication, and processing levels. It is important to establish a direction for the

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acquisition and use of new information technology based on an improved understanding of burgeoning technologies and methods for delivery in the business environment.

2.3   Distributed Processing

Performance, centralization vs. decentralization, and departmental computing are the next catagory of focus. "System up-time and terminal response time are critical to our operation," says the director of a Philadelphia hospital. "The hospital is currently evaluating its existing telephone systems as well as its existing data transmission lines of its on-line, real-time patient care system running at the two locations of the hospital. Providing fast, accurate, and reliable services is critical."

"Centralization and decentralization is the issue!" says the director of systems development and operations of a highly decentralized pharmaceutical company. "We experienced several changes in our organization at the management committee level - hence there have been some pendulum swings in directions. It is very difficult to coordinate, realize any economies of scale, or standardize operations without architectural guidelines."

"Departmental computing is a trend in informance services," says the vice president and manager of information services of a major bank. "It is growing rapidly with business/market driven strategies. We need to better prepare management to get the most out of this new trend."

17% of the executives interviewed cited performance as the top concern facing their organizations with a mean of 7.24. 15% mentioned centralization vs. decentralization as the top concern with a mean of 6.87. 13% cited departmental computing as the top concern with a mean of 6.8. There is also a significant correlation between departmental computing and centralization vs. decentralization, suggesting that they should be considered together.

Price, speed-performance, reliability, and availability have been the primary goals of information systems design for decades. Research has been conducted to design large capacity, cost-effective systems with rapid response time [Madnick and Wang, 1986; Goyal and Agerwala, 1984]. In the private sector, commercial database machines, such as Britan Lee's IDM 500 and Teradata's DBC 1012 [Computerworld, 1985], specialized to information management have been introduced.

Centralization and decentralization has also been discussed extensively for almost a decade. Rockart [1978] provided a framework for analysis of centralization and decentralization. The framework consists of three major dimensions: systems operations, systems development, and systems management. It's interesting to note that the 1984 Delphi study by Dickson et. al. did not explicitly rank centralization and decentralization as an important IS issue.

In sum, issues in distributed processing have been gathered around the efficient and smooth operation to meet organizational information needs responsively.

2.4   Operational Issues

One interesting result was that very few executives cited operational issues, such as security and backlog, as the top concern in their organizations. Although they may not have been a top concern, many executives did view them as important.

"There is increasing pressure on security from users within the corporation, customers, and suppliers because of the need for more electronic data exchange," says the director of a rail corporation.

"A number of applications will not be implemented until well into the 1990's," says the general director of information systems of a brewing company. "Other backlog items have not been considered for prioritization ... and, given current staffing level, will most probably not be addressed until the 1990's. Consequently, top management strongly perceives the information systems department to be lethargy rather than thrusting."

"There is always more work than resources," says the director of corporate business systems. "We have a method for setting priority. However, we would like to do more without adding staff... Some productivity products are not as productive as venders claimed and fourth generation languages are not realistic for high volume transaction systems."

It is not uncommon for organizations to have a significant application development backlog ranging from one to four years. The problem of backlog and security is both technical and behavioral. A cooperative effort between IS personnel and the various user groups is needed to optimize opportunities and potential. Definition of roles and responsibilities and provision of tools to facilitate end-user development must be clarified as much as possible.

In our study, although backlog did receive a mean importance of 5.72, less than 1% of the executives identified it as their top concern. In view of the comments from some participants noted above and the traditional perception of applications backlog as a major challenge, this finding may be viewed as quite surprising. In fact, this finding is paralleled in a recent study of 120 senior executives reported by Arthur Anderson and Co. [1986] where applications backlog was ranked 15 on a list of 22 concerns. There are two related forces at work that could explain this reaction: (1) new productivity tools and dispersion of software development to end-users have actually lessened the magnitude of the backlog faced by many IS organizations, thereby reducing its importance, and (2) the emergence of new important concerns that did not exist previously, such as strategic computing, connectivity, and networking, has pushed backlog even further down the list.

3 Focusing on Key Issues

The recent years have witnessed revolutionary changes in the IS field. In effect, all enterprises (be they firms, governmental units, or nonprofit organizations) face a technological revolution in capabilities of information storage, manipulation, and communication. The revolution is moving rapidly from the backoffice functions such as payroll, personel, budget, to the basic strategy and products of the enterprise.

A key to success for an executive will be the capability to clearly understand, prioritize, and predict major IS issues. As noted by the chief executive of a major manufacturing corporation: "It is of the utmost concern to me because at stake is the company's future. Articulate key issues, develop strategic options, and implement new IS infrastructures to compete globally will be the only way the company can survive in today and tomorrow's world." This study indicates that key executives making IS decisions are focusing their attention on emerging technologies with strategic implications to facilitate inter and intra organizational computing. Value adding to that chain of computing is based on a backbone communication network (underpining new IS infrastructures), connectivity among diverse systems, and finally redefinition of strategic options for competitive advantage.

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