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Management of information technology in Swedish firms: An empirical study

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ABSTRACT

This study examines the role and the involvement of management in information technology acquisition, planning, and development. The results indicate that top management plays a major role in setting the overall information technology policies. In addition, the Chief Information Officer (CIO) plays a crucial role in the merger of information strategy and corporate strategy.

The result also indicates that user's satisfaction is considered to be the most important factor for justification of information technology acquisition.

INTRODUCTION

The functions which information systems perform in the business world have progressed through several evolutionary stages since the 1950s when computers first became available and affordable for commercial data processing applications. From the first tentative and specialized applications in functional areas such as personnel, inventory, and finance, information technology has mushroomed to have a significant effect on all areas of all organizations. Even more important is the fact that the information systems provide the integrative glue which cements all the separate areas into a manageable whole.

Until recently, top management had a passive role in the development of information systems in the firm and did not participate in automation except to approve and budget for hardware and software acquisitions. Top management was content to let the middle level of management and the information systems managers determine information needs and priorities, often on an

ad hoc basis without any clear plans or guidelines. Today, however, top management has taken a much more proactive stance in technology. It is now recognized that top management's participation in developing a strategy for technology and the linkage of this technology strategy to the corporate strategy form a powerful competitive weapon (Wysocki & Demichell, 1997). Therefore, it is critical for top management to understand the importance of integrating information technology within and among all levels of management. It is necessary that top management support user participation in acquisition and implementation of new technology, and that they learn the broad spectrum of benefits that top management can reap from active involvement.

The challenge for the chief information officer (CIO) and information systems personnel is to recognize that their job is to create technology architectures that are sensitive to the needs and demands of their users. They must perform a regular market analysis of their internal customers - those within the organization - to determine what information products are needed, sell the latest technological advances, work with these internal customers for new product development, and provide customer service throughout the product life cycle. An important, subsequent step is to coordinate information systems across organizational boundaries such as networking and electronic data interchange with suppliers and customers of the firm.

The CIO must work with top management to work on horizontal integration of functional areas such as those essential to human resources management and education, to accounting and budgeting and to the creation and distribution of goods and services. Development of integrative systems requires cooperation between the CIO and corporate management at all levels. The involvement of top management in these efforts needs to be more than symbolic to maximize the benefits of technology (Ware, 1993).

THE STUDY

To assess the area of information technology, a benchmark study was developed. The primary goals were to see who participated in the planning, appraise how much integration there appeared to be, and analyze which functional areas are the major users and prime beneficiaries of information technology today. The top 500 Swedish organizations were selected as a study population. A four-page questionnaire was mailed to all 500 organizations with a cover letter and a return envelope. The mailing target within each organization was the chief information officer (CIO). The cover letter explained the six specific objectives of the study as follows:

- To collect personal and occupational data of the CIO and the CIO positions of the Swedish organizations.
- To determine the degree of participation by management in the development of information systems strategy.
- To find the level of involvement by functional areas in the implementation of information systems programs.
- To ascertain who are the drivers of change in the organizations' information systems programs.

- To gather information on the relative importance of major variables used in the justification of the new technology.
- To determine the extent of information systems applications which are implemented in the firms.

After the initial mailing, a follow-up mailing was made to the non-respondents. In all, there were 153 responses for a 30.6% response rate. Of this figure, 29 responses were not usable because of missing data or lack of internal validity in the responses. Thus, 124 usable questionnaires (24.8%) furnished data for analysis.

CIO PROFILE

The information which the survey and analysis provided about the CIO's level of education, educational area of specialization, salary, years of experience in information systems, and years in the current position give useful insights into the information system profession as a whole.

The majority of respondents reported that they have earned at least a Bachelor's degree. Of those with degrees, 6.6% possess Doctorates or equivalent; 16.7% have a Master's degree; and 76.7% hold a Bachelor's degree. It is clear that a college degree has been a required stepping stone in the rise to being a CIO.

Among the participants, engineering was the most common field of study with 39.7% of the respondent CIOs. Mathematics/ statistics formed the next highest group with 26.4%, followed closely by those with business and economics backgrounds with 22.6%. Only 11.3% have earned a degree in computer science. Although it may appear that a degree in information science may not be a requirement for advancement to the CIO position, many of the CIOs may already have had their degrees when the information age began and thus earned their way to the top by being in on the ground floor when technology started to spread.

The fact that almost two-thirds have degrees in engineering and mathematics/statistics indicates that a quantitative background was probably preferred in the early days of information science. The fact that a little over one-fourth of the CIOs have business and economics degrees may indicate that there are good opportunities for people with systems applications type skills who can use the technology as a tool to support the organization. The study did not try to determine what degrees are needed today to become the CIO in the future.

CIOs have, on the average, eighteen years of experience in information systems and have been in their current positions for seven years. This indicates that, in general, the CIO is well experienced in both the field of information systems and the position he/she occupies. It also, once again, draws attention to the fact that the educational degrees which today's CIOs earned eighteen years ago may not be relevant to today's entrants into the field. As information systems become more integrative across functional areas of the organization, managerial skills may gain in relative importance to computer skills to the future CIO (Kettinger, 1995).

One of the questions in the study solicited data with regard to CIO's annual base salary, excluding bonus and incentive programs. Table 1 shows the base salary of the responding CIOs in U.S. dollars. No one in the sampled group earns more than \$100,000 annually.

Table 1. The Chief Information Officer's Annual Base Salary

<u>Annual Base Salary Range (\$000)</u>	<u>Percentage of Respondents</u>
Less than 50	47
50-60	30
61-70	12
71-80	7
81-90	2
91-100	2

The main reasons for not inquiring about compensation programs and restricting the information to base salary are:

1. Such information is privileged in many organizations.
2. Asking for such information may have reduced the response rate.
3. Getting compensations on a comparative basis would be extremely difficult.

Nevertheless, the survey salary data provides a useful starting point for those who are planning on entering a career in information systems and for those who are planning an information systems organization.

INFORMATION TECHNOLOGY PLANNING AND IMPLEMENTATION

Today, as never before, management in the business environment needs, and must demand, huge amounts of information. Success depends on having the right information immediately available to solve a wide variety of problems. Given the exploding technology of recent years at rapidly decreasing costs, there is no reason for any level of management in any functional areas using antiquated processes. Inventory, personnel, finance, transportation, marketing and purchasing managers, to name just a few, have recognized the need for automation of the information processing in their functional areas.

As each functional area automated, however, there was a tendency for each to develop or purchase its own separate software programs, acquire hardware which optimized the functional area's efficiency and accumulate data bases peculiar to the functional area's needs. It became clear that there was a considerable amount of overlap and redundancy among the separate systems. For the company as a whole to get the maximum advantage of information technology, the functional areas systems must be meshed together into a coordinated effort. Just as a company's accounting system should serve the firm as a whole, so should the information system.

Thus, it is no longer appropriate for a CIO to allow a corporate information system to exist, which simply reacts to corporate strategy. Information technology cannot play only a passive role, supporting the firm in achieving its goals. CIOs should play a proactive role in the development of information technology strategy, including information strategy as part of the corporate strategy and in involving top management and functional area managers in the information strategic plan. Top management's participation provides the necessary linkage between corporate objectives and the information technology plan. In addition, participation of functional area managers in the development of information technology strategy creates an atmosphere to integrate information technology throughout the organization.

Survey respondents rated the degree of participation by functional area management in developing the overall information technology strategy on a scale ranging from 0 (no participation) to 4 (maximum participation). The results are given in Table 2. As expected, the CIOs rated information systems management as having the highest input to technology strategy with a 3.22 score out of a maximum of 4.0. The second highest score of 2.98 was given to top management. The results show clearly that top executives in Sweden have recognized the value and the role of information technology in gaining a competitive advantage.

Finance and accounting also were markedly ahead of the rest of the functional area managers. This is not surprising since financial considerations were one of the first course, is pervasive throughout the firm, and is a major beneficiary of the speed and accuracy of information technology.

Table 2. Management Participation in Setting Overall Information Technology Policy

Participating Functional Area	Average Rating
Top Management	2.98
Finance and Management	2.61
Human Resources	1.21
Purchasing	1.26
Information System	3.22
Marketing	1.77
Distribution	1.48
Production/Operation	1.85
Technical Staff	1.53

The results in Table 2 demonstrate that there is a working partnership among the information systems department and other users in the strategic planning process. It indicates that there are some areas which could be more proactive in forming a stronger information systems partnership, particularly in the areas of creation and distribution of goods. It must be noted, however, that the study was not restricted to just industrial or production firms. Furthermore, as an exploratory investigation to establish an initial benchmark, the scores cannot yet be adjudged as to "goodness" or "badness." The relationship shown by Table 2 enables the user management to recognize opportunities for efficiency or innovation that could lead to competitive advantage.

The survey also asked respondents to score the degree of interaction which exists between the CIO and the top executives of the organization with regard to several key information systems activities shown in Table 3. Scores ranged from 0 (no interaction) to 4 (intensive). Development of the long-range information systems plan scored the highest interaction (2.93) of all the activities. This indicates that there is good coordination, with top management participation in identifying technologies and the information needs for achieving business strategies and objectives.

Table 3. Interaction between CIOs and Top Executive in Key Information System (IS) Activities

Information System Activity	Average Rating Range 0-4
Long-Range IS Plan	2.93
Short-Range IS Plan	2.59
IS Mission Statement	2.55
IS Budget	2.81
System Design	1.37
Security & Back-Up Plan	1.65
Setting Priorities	2.35

Technology acquisition, systems development and implementation are generally capital intensive. It is therefore not surprising to find that many CIOs spend a good portion of their time convincing the top executives to allocate financial resources for their projects while preparing the IS budget, which was ranked as a strong second activity for CIO interaction with top management (2.81). Personnel costs for qualified information systems people are apt to be an important human resource expense which may be a component of the CIOs IS budget. There is also a high degree of communication between CIO and top management in developing the IS mission, setting priorities for IS projects, and IS short range plan. An item of interest is the low score given to security and contingency back-up plans.

Steering committees for information technology planning are becoming a very common, popular method of linking the corporate strategy to information systems strategy. The steering committee is comprised of representatives from all major functional areas and top management. The membership of the steering committee provides a structure for determining how the information systems department interacts with other functional areas of the firm in systems planning and integration and provides a vehicle for coordinating information flows among functional areas. The steering committee can also assist the CIO to set priorities for projects to be implemented.

The majority of the respondents (66%) reported that they have a steering committee which meets on a regular basis. Table 4 shows the number of steering committee meetings per year for those organizations reporting committees. There appears to be evidence to support that the steering committee meetings may be linked to the budget cycle process. The 35% which meet once a year may be linked to the annual budget justification, while the 27% which meet quarterly may be linked to quarterly reviews. This would help explain the two peaks in the distribution of Table 4.

Table 4. Number of Steering Committee Meetings Per Year

Number of Meetings	% of Firms
1	35
2	10
3	9
4	27
5	4
6	11
12	4

It is assumed that those organizations which do not have a steering committee (34%) have other systems in place for involving management in information technology planning, since they all responded to information systems planning and implementation questions.

Successful implementation of an information technology plan requires leadership by the information systems department and the inclusion of the user departments in the process. Involvement of the functional units in the implementation process is particularly important since information technology applications cross functional unit lines. The user participation facilitates implementation activities and a sense of ownership in the system, which lead to further use of the technology, Table 5 shows the amount of participation of the information systems department and the rest of the functional areas of the firm in systems implementation.

Table 5. Functional Area Participation in Information System Program Implementation

Functional Area	Average Rating Range 0-4
Top Management	1.95
Finance & Accounting	2.42
Human Resources	1.27
Purchasing	1.27
Information System	3.31
Marketing	1.89
Distribution	1.51
Production/Operations	1.76
Technical Staff	1.26

Again, as can be expected, the CIOs in the responding organizations reported that the information systems departments assumed the leadership role during the systems implementation phase with an average rating of 3.31. It is interesting to note that all functional areas involved in the strategy phase are also involved to almost the same degree in the implementation aspect of the plan. With the exception of the top management, all organizational units have relatively the same degree of participation in the development of the strategy as they do in the implementation process.

Once the implementation phase is completed, the functional user management becomes responsible for preserving the integrity of the system and ensuring its application. The data do show that the functional areas involved with the creation and distribution of goods--that is marketing, distribution, and production/operations--are currently more involved in implementing new systems than are those functional elements involved in strictly internal management. Although no judgment can be made about the "goodness" or "badness" of the individual functional area scores, the consistency of scores between the planning phase and the implementation phase seems to be a desirable thing. Again, the variety of the firms in the study restricts the value of the data to a macro study. The data should not be used as a benchmark for any particular industry.

Top management participation during implementation ensures conformance to corporate policies and procedures. The Swedish top management show a high degree of commitment (third highest) in this process. This level of support by top management and the generally participative management style in Sweden, also promote a positive attitude in the user toward the new system and allows the information technology to make its maximum contribution to the organization.

Ideas for Change

The proliferation of new technologies has produced a virtual explosion of new opportunities for the organization to incorporate competitive applications on all fronts in order to support its vision. Those firms which fail to take full advantage of the information age tools have earned the right to lose the competitive race. Different functional areas of the organization should be active in the introduction of new ideas for change. Support for change could be for two reasons: (1) to remain competitive, or (2) to gain advantage over the competition.

Clearly, the CIO and the information systems professionals must stay current with the latest development and future potentials of key technologies for change. However, any functional area in the firm can act as an agent of change and be a driver of change. Professional journals and meetings, trade magazines, educational institutions, the news media, and network systems are bombarding the functional area managers with barrages of new applications. One cannot help but notice all the ways that competitive companies are taking advantage of new systems. Indeed, there are many forums for trading information about new systems improvements, such as network news exchanges. Noticeable change requires a strategic response that includes a collection of factors such as the organizational structure, the strength of competitive position, and the competitive environment of the industry.

The survey respondents identified the extent of responsibility exercised by various departments in the introduction of new ideas for change in the past five years. Table 6 depicts the results. It is apparent that the information systems department leads in this endeavor, as expected, followed by finance and accounting. The marketing professionals of the Swedish firms showed the third highest level for the introduction of change. They exhibit their awareness that the marketplace demands product variety and is characterized as time and cost sensitive. As customers enter the information age, they expect their suppliers' marketing departments to have accurate, current data at their instant call. Information technology has made customer service a major competitive tool in many areas such as reducing the paperwork of ordering, ensuring timely delivery, automatic billing and fund transfers, and accurate shipment identification data.

Shorter product life cycles and increased frequency of new product design necessitate change in the production and operations processes. Table 6 data indicate that production/operations managers have been active in the presentation of new ideas to meet consumer demands.

It is worth noting that, on the one hand, marketing and distribution were both reported as having higher involvement in introducing new ideas than they had in strategy. On the other hand, top management, finance and accounting, purchasing and technical staff all had lower scores in new ideas than they did in strategy. This suggests that customer satisfaction is the area where the focus of strategic information systems planning and information technology resources may still need to be placed. The decreasing number of new ideas from internal operations, such as finance and accounting and human resources suggests that most firms have adequate systems, which do what management wants, already in place.

Table 6. Introduction of New Ideas for Change by Functional Area over the Past Five Years

Functional Area	Average Rating Range 0-4
Top Management	1.75
Finance & Accounting	2.04
Human Resources	1.25
Purchasing	1.15
Information System	2.96
Marketing	1.91
Distribution	1.56
Production/Operations	1.77
Technical Staff	1.25

Justification of Information Technology Acquisition

Traditional cost-justification techniques associated with technology acquisition are useful when such tangible factors as labor savings, increased profit, and hardware and software costs are evaluated. However, these methods, in general, fail to consider the benefits of the new information technology that are intangible and long term. In order to assess some of the variables used in the adoption of the new information technology, the surveyed firms were asked to rate five variables on a scale between zero and four. Table 7 shows the importance of these variables.

Table 7. Importance of the Variables Used in Justifying New Technology

Variavle Used	Average Rating Range 0-4
Acquisition Cost	2.69
User Satisfaction	3.05
Meeting Competition	2.81
Service to Customers	2.99
Advances in Technology	1.94

Although acquisition cost, with a rating of 2.69 is an important factor in adoption of new technology, as user satisfaction, service to customers, and meeting competition ranked higher than cost. This indicates that Swedish managers have realized the potential benefits of the new technology in strengthening the organization's competitive position, as well as increasing individual productivity and functional efficiency. The results also indicate that there is a strong relationship between user satisfaction and user involvement in both strategic planning and implementation of the new technology. The low rating of advances in technology is due to the fact that many firms do not need to remain at the leading edge of technologies to maintain their competitive advantage. Thus acquisition of technology for its own sake is not as important as what the technology advances may be able to do.

Information System Application

Determining the magnitude of information systems applications by the functional user assists the steering committee and the information systems department in setting priorities for various program development and implementation. The survey sought the views of the CIOs regarding the importance of information systems applications in their respective organizations. The results are shown in Table 8.

The functions of billing and sales reporting, which deal with cash inflows, received the highest ratings by the respondents. Two groups of applications form the second tier in the ratings. The first second-tier group includes applications dealing with the generation of future sales (that is, market analysis and sales forecast). The other second-tier group deals with the value creating aspects of the firm other than to support the marketing aspects (that is, production scheduling and purchasing to support the production plan).

Table 8. Importance of Information Systems Applications

Application Area	Average Rating Range 0-4
Billing	3.24
Sales Forecast	2.61
Market Analysis	2.50
Inventory Management	2.10
Purchasing	2.40
Sales Reporting	2.96
Transportation	1.98
Production Scheduling	2.50
Financial Modeling	2.45
EDI Customer	1.90
EDI Supplier	1.60

The questionnaire sought information about three areas of inter-firm technology applications. One area was electronic data interchange (EDI) between the organization and its customers, and a second was EDI between the organization and its suppliers. The third area was interface between a company and its transportation providers. All three areas were rated very low.

This cannot be construed to mean that they are unimportant for two reasons. The first reason is that there is still a lack of standard data formats so that, for example, a purchasing department organization with twenty principal suppliers might have to develop an interface with twenty different formats. The same would be true with customers or transportation carrier interfaces. The second reason for the low scores could be the differences in the organization missions of the firms in the study. Many may not be amendable to EDI-type operations.

CONCLUSIONS

Proliferation of information technology throughout the organizations has created a unique role for information technology in strategy development and strategy implementation. Top information systems professionals should be involved in developing corporate strategic planning. User managers should also be involved in information technology planning, implementation, and ensure its applications. The user managers are the information system's customers; the product that the information system strategy develops is only as useful as the customers' needs determine it to be.

The CIO plays an important role in the merger of information strategy and corporate strategy. Participation of the CIO, with other managers in strategic planning, will provide the organization with an opportunity to explore ways to use information technology as a strategic weapon. It would be ideal if a firm could work along with its customers in developing the exact product that the customers need. The CIO has this ideal opportunity to serve the customers in the firm.

Management of Swedish firms which participated in the survey seem to have recognized the value of information technology as a corporate resource that can be used to improve their strategic positions and to remain competitive. An area for future study is whether information technology as an inter-firm, value-added chain resource can be exploited better than it now is.

REFERENCES

- Carlsson, B. & Jacobsson, S. (1994) Technological systems and economic policy: The diffusion of factory automation in Sweden. *Journal of Research Policy*, 23, 235-248.
- Cole, C. (1994, August). Operationalizing the notion of information as a subjective construct. *Journal of the American Society for Information Science*, 45(7), 465-476.

- Drucker, P. F. (1992). *Managing the future: The 1990s and beyond*. New York: Dutton.
- Drucker, P. F. (Sept.-Oct., 1994). The theory of business. *Harvard Business Review*, 95-104.
- Ferne, G. (June/July, 1993). What outlook for IT? *The OECD Observer*, 182, 23-26.
- Framel, J. E. (December, 1993). Information value management. *Journal of Systems Management*, 16-41.
- Frey, D. N. (1992). Information systems for business: A look past and a glimpse into the future. *International Journal of Technology Management*, 7(6-8), 390-397.
- Hagedoorn, J. & Schakenraad, J. (September, 1993). A comparison of private and subsidized R & D partnerships in the European information technology industry. *Journal of Common Market Studies*, 31(3), 373-390.
- Keen, P. (1991). *Shaping the future: Business design through information technology*. Boston: Harvard Business School Press.
- Kettinger, W. J. (Winter, 1995). Information reengineering and technological advances challenge managers. *Information Systems Management*, 12(1), 35-44.
- Kim, B. (December, 1994). Business process reengineering. *Journal of Systems Management*, 45(12), 30-36.
- Lester, C. (July, 1989). Europe's information seekers. *Datamation*, 17-18.
- Porter, M. E. & Miller, V. E. (July-June, 1985). How information gives you competitive advantage. *Harvard Business Review*, 140-160.
- Ware, R. (January, 1993). MIS: Junior partners for strategic objectives. *Journal of Systems Management*, 38-42.
- Wysocki, R. K. & Demichell, R. L. *Managing Information Across the Enterprise*, John Wiley & Sons, Inc., 1997.

