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Key Issues in Information Systems Management

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Abstract

The results from a five-part Delphi survey of chief IS executives and corporate general managers indicate the most critical information systems management issues and consensus on their importance. The research project is the second in a series of such studies conducted by the Society for Information Management and the MIS Research Center at the University of Minnesota. The research confirmed the expected in some areas and revealed surprises in other areas. While strategic planning continued to top all issues in importance, many changes have occurred since 1983. Three new issues have joined the top ten issues in importance. Also, the rank order of several issues in the top ten has shifted. Survey results are discussed in terms of the differing views of IS executives and corporate general managers. A review of how these views have changed over time is also presented. A number of conclusions are drawn about managing information systems and about the changing nature of the IS executive's job.

Keywords: IS management, key issues, management priorities, delphi technique

ACM Categories: K.3.2, K.6.0, K.6.4

Introduction

The information systems (IS) community is continually making difficult value judgements on what issues its management, research, and educational resources should be focused. Businesses make decisions about where to commit limited funds. Researchers make decisions about which issues to study. Academic institutions make decisions on the shape and direction of educational programs. Professional societies arrange conferences to deal with contemporary issues. For these reasons and more, an awareness of issues that leading professionals feel are of critical importance is very useful.

Three years ago, the Society for Information Management (SIM), in a joint effort with the MIS Research Center (MISRC) at the University of Minnesota, conducted a Delphi survey of its members to formulate key issues in information systems and reach consensus on their importance. The results of that study were published in the *MIS Quarterly* in September 1984 [3]. The key issues framework developed in that study has been widely cited in the profession's academic literature and in its trade journals. It is believed that the issues delineated in that study have influenced research and educational programs at universities across the country. At SIM, for example, the issues have provided a framework for its research program and themes and topics for its conferences.

Three years provide a lot of time for change in the information systems profession. To keep the key issues framework current, SIM and the MISRC initiated a study in 1986 to reevaluate the key issues in information systems management. The study is part of the MISRC's Management of Information Systems research program.

The primary purpose of the research was to reevaluate the questions posed by the 1983 study as follows:

1. What are the ten most critical issues facing IS executives over the next three to five years?
2. What is the order of importance of these issues?
3. How much agreement is there among IS executives about the importance of these issues?

As an enhancement to the original research framework, this study was designed to determine what corporate general managers outside of IS think are the key information systems issues of the next three to five years. It was felt that such executives would have a broader view of the organization which might lead them to different opinions about which issues are most critical. This study was also designed to determine how the key issues had changed over the three-year period since the last study. Thus, the secondary research questions posed by this study are as follows:

4. How closely do corporate general managers outside of IS agree with IS executives on the key issues and their importance?
5. How have the most critical issues in information systems changed over time?

A five-part Delphi survey of chief IS executives and corporate general managers, combined with a historical analysis of prior research, was used to answer the questions posed. The methods used for the research are outlined in the next section. Following this, the results of the survey are presented. Next, the results are discussed in terms of the differing views of IS executives and corporate general managers and in terms of historical trends. Finally, a number of conclusions are drawn about managing information systems and about the changing nature of the IS executive's job.

Methods

Research methods were selected to facilitate comparison of results with the key issues framework generated in 1983 [3]. As in 1983, Delphi was deemed an appropriate method since a major goal of the project was to reach a reasonable level of consensus about the key issues in information systems management.

Delphi Method

Delphi is a group process which utilizes written media to solicit and aggregate the judgements of a number of individuals [8]. Its aim is to improve the quality of the group's work. Essentially, Delphi is a series of linked questionnaires. Starting with an open-ended questionnaire, succeeding

questionnaires feed back group responses to the preceding questionnaire and ask for further information. The process stops when consensus among individuals has been reached or when sufficient information has been exchanged [2].

The 1983 SIM/MISRC Delphi study employed four rounds of questionnaires. The first round was used to generate issues of major concern to IS executives. Open-ended responses were classified into 19 relatively distinct issues by the researchers. Succeeding rounds were used to rank and re-rank the issues. A reasonable level of consensus on the top ten issues was reached at the end of three rounds.

Research Method

To enable comparison of results with those from 1983, research began where the previous study ended. Data was collected in three rounds of surveys as follows:

Round One: SIM institutional and board members were asked to review the list of key issues generated in 1983. The issues were presented in random sequence via mail questionnaire. Participating IS executives were asked to consider what they thought were the ten most critical issues facing them over the next three to five years. They were asked to rank only their ten most critical issues. Participants were encouraged to update issue rationale and add new issues to the list. In round one, 180 questionnaires were mailed. Usable responses were received from 90 IS executives yielding a response rate of 50%. Samples of survey instruments used in the study are provided in Appendix A.

Round Two: IS executives responding to the first round were sent feedback showing the results of the first round. New issues were listed only if they were suggested independently by at least three respondents. Issues were presented in order of importance as determined by mean rank. Respondents were again asked to rank their top ten issues in order of importance. In round two, usable responses were received from 54 executives yielding a response rate of 62%.

Participating IS executives were also asked to deliver a packet of survey instruments to the president, vice-president, or corporate general

manager (hereafter referred to as general manager) to whom the firm's chief IS executive reported. The packet contained a cover letter introducing the study and a set of ranking forms similar to those for IS executives. The general managers (GMs) were asked to consider what they thought were the ten most critical issues facing information systems managers over the next three to five years. Usable responses were received from 21 general managers.

Round Three: All participants from previous rounds received feedback showing the rankings of the IS and GM groups. They were asked to rank their top ten issues one last time. Usable responses were received from 68 IS executives (76% response rate) and 12 general managers.

The three rounds of the survey provided an opportunity to reach a reasonable level of consensus within and between the two groups of respondents. In the discussion which follows, data presented is from the final round of the IS executive part of the survey unless otherwise indicated.

The Participants

As in 1983, all institutional and advisory board members of SIM were invited to participate. Institutional and advisory board members are particularly appropriate for this type of study since they are usually the highest ranking IS executives in their firms.

A profile of the survey respondents by geographic location, industry, and position is provided in Figure 1. Geographically, all major regions of the United States were represented. Compared to 1980 census data, the Northeast (43%) was somewhat over-represented. This occurred mostly at the expense of representation from the South (12%). The Midwest (29%) and West (16%) were represented in the proportions expected by their population. As in the 1983 study, the majority of the respondents companies were in manufacturing (43%) and services (34%). Also, the vast majority of respondents (81%) held the highest ranking IS position within their firms. This was expected and was a chief reason for restricting the survey to SIM institutional members. All of the general managers participating in the survey were vice-presidents. About one third were also chief financial officers for their firms.

Findings

The research confirmed the expected in some ways and revealed surprises in others. While traditional concerns such as strategic planning and organizational learning remain critical, three new issues joined the top ten for the first time. Two of the new issues, competitive advantage and information architecture, were not salient enough three years ago to have been included in the 1983 survey. The other new issue, increasing understanding of the information systems' role and contribution in the organization, ranked an obscure 15th three years ago.

Top Ten Issues

The most critical issues facing IS executives over the next three to five years are listed in Table 1. Each issue is discussed briefly below.

Strategic Planning: Improving strategic planning was ranked first in importance. Strategic planning has long been a difficult and important issue for IS executives. It has perennially ranked first in studies of this kind [1, 3, 4, 5]. Effective planning requires the discipline and vision to foresee problems and opportunities within a turbulent and complex environment. It requires the ability to develop courses of action based on rapidly changing technology. With increased use of information systems to carry out business strategy, it has become imperative for IS executives to align their long-range information system plan with their company's strategic business plan. Rapidly changing business environments, increased involvement of end users, accelerated technological change, and lack of reliable methods underscore the IS executive's need to continue improving strategic planning skills.

Competitive Advantage: Using information systems for competitive advantage was ranked second in importance. This issue has burst on the information systems scene in recent years. In 1983, competitive advantage was not salient enough to stand alone as a distinct issue. Information systems are now considered to be a major strategic weapon by many corporations. Firms are staking the entire enterprise's welfare on their ability to process and maintain accurate, timely information. Competitive advantage results from recognition of opportunities through creativity and innovation, followed by rapid and

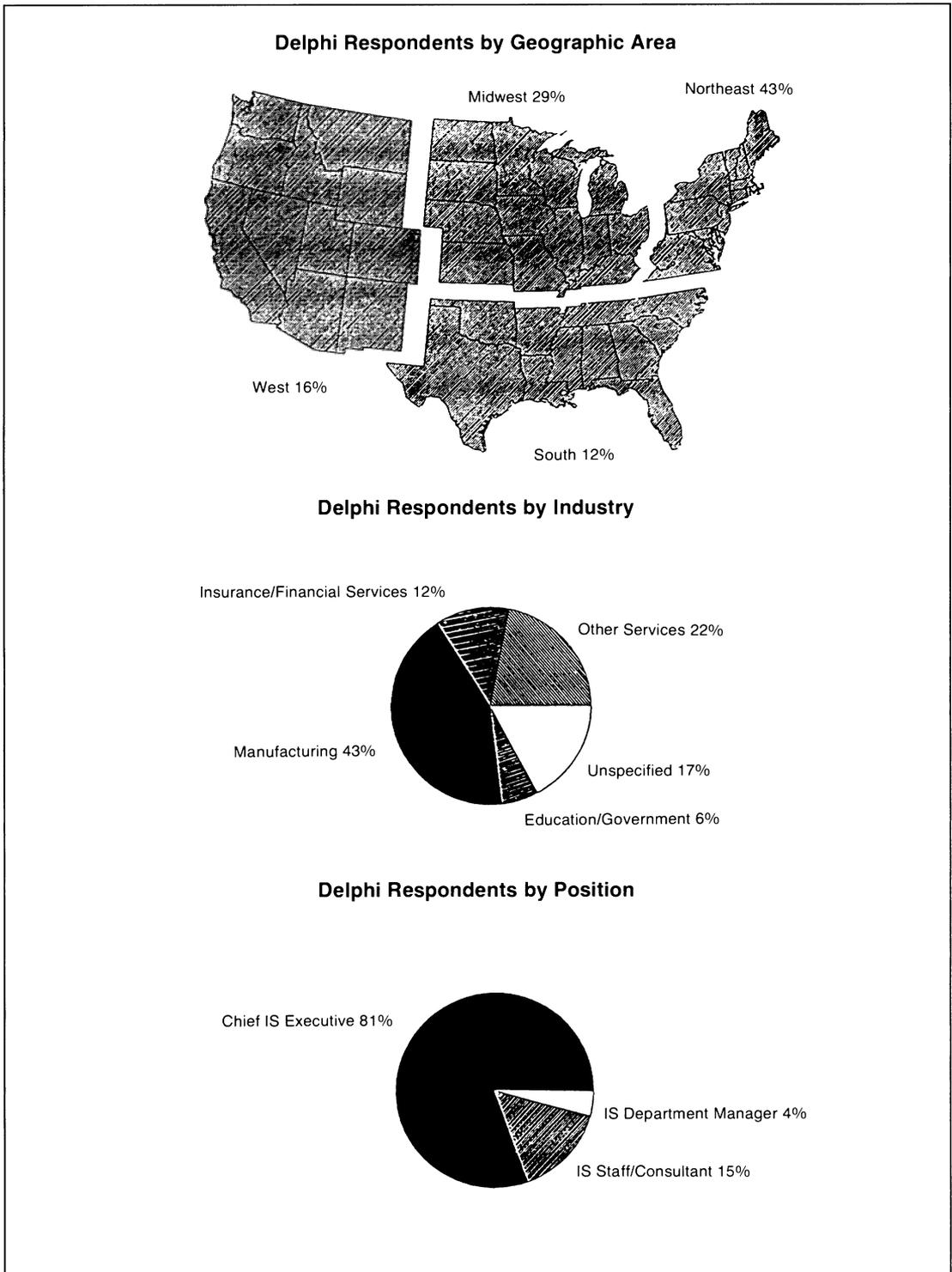


Figure 1. Delphi Respondents by Region, Industry and Position

Table 1. Key Issues in Information Systems Management

IS Rank (n = 68)	GM Rank (n = 12)	Description of Issue	IS Executives (Final Round)		
			Mean Rank	Standard Deviation	Percent Top Ten
1	1	Strategic Planning	8.6	2.60	96%
2	2	Competitive Advantage	7.4	2.49	94%
3	3	Organizational Learning	7.0	2.18	98%
4	5	IS's Role & Contribution	6.6	2.95	93%
5	7	Alignment in Organization	4.9	2.87	87%
6	6	End-User Computing	3.8	2.50	85%
7	8	Data as Corporate Resource	3.6	2.64	78%
8	9	Information Architecture	2.9	2.69	76%
9	4	Measuring Effectiveness	2.6	2.83	60%
10	10	Integrating DP, OA, FA, TC	2.2	2.19	68%
11	11	Telecommunications	1.4	1.84	53%
12	13	Human Resources	1.2	2.22	34%
13	12	Software Development	0.8	1.86	24%
14	16	Multi-Vendor Integration	0.5	1.61	13%
15	NR	Artificial Intelligence	0.4	1.29	10%
16	15	Applications Portfolio	0.3	1.20	9%
17	14	Factory Automation	0.2	1.00	7%
18	NR	Security & Control	0.2	0.88	6%
19	NR	Packaged Software	0.1	0.70	6%
20	NR	IS's Funding Level	0.1	0.52	4%

Notes:
NR indicates issue listed was not ranked in top ten by any respondent

effective implementation of information technologies to take advantage of these opportunities. Unfortunately, these are historical weaknesses of IS.

Organizational Learning: Facilitating organizational learning and use of information systems was ranked third in importance. Organizations that prosper in the future will be those that integrate appropriate new IS technologies into their entire operation. As implied in the discussion on strategic planning and competitive advantage, information systems are no longer relegated to the back office. Once the domain of specialized technical managers, information systems are be-

coming the concern of every manager in the organization. Business practices and organizational structures will need to be modified in many cases. Education and development will be needed on a massive scale. IS will need to lead the way by demonstrating its own ability to be responsive to change.

IS's Role & Contribution: Increasing understanding of the role and contribution of IS was ranked fourth in importance. This issue has dramatically increased in importance over the past few years. In 1983 it ranked an obscure 15th. Its rise in importance may be tied to the strength of each of the preceding issues. Despite their potential

strategic impact, IS organizations are often viewed as an overhead expense, with little appreciation of their contribution to the business. This can lead to ineffective and inappropriate use of technology. It can also lead to cuts in funding and limitations to the use of information systems for competitive advantage.

IS's Alignment in the Organization: Aligning the IS organization with that of the enterprise was ranked fifth in importance. The effectiveness with which IS can support the enterprise's information needs is dependent on its position within the enterprise. Information systems departments reporting within a traditional functional area, such as finance, often find that they over-emphasize financial systems development at the expense of other opportunities within the enterprise. On the other hand, reporting in a 100% staff role may isolate IS from the mainstream of the enterprise. Establishing appropriate reporting relationships is a difficult managerial and political problem. It has become more troublesome as organizations decentralize.

End-User Computing: Facilitating and managing end-user computing was ranked sixth in importance. The proliferation of end-user computing through personal computers offers the promise of improved productivity, but also entails risks from poor management control. Many technological, managerial and political problems are involved. Inadequate data integrity, "orphan" applications, and fragmented systems can result from lack of planning and control. While failure to set up controls is an evasion of management's responsibility, over-control can reduce productivity. IS must balance its control of end-user computing with enough slack to encourage innovation and learning.

Data as a Corporate Resource: Promoting effective use of the data resource was ranked seventh in importance. Over the past ten years, a substantial portion of the information systems literature has been directed toward developing new methods for managing information. The organization's data resource is growing in size, complexity and value. Despite this, it remains largely unrecognized, inaccessible and underutilized. Information systems managers have found it difficult to develop a climate within their organizations which values data as a corporate asset.

Information Architecture: Developing an information architecture was ranked eighth in importance. Information architecture is another newcomer to the key issues framework. An information architecture is more than a means for promoting data as a corporate resource. It is a high-level map of the information requirements of an organization. It shows how major information categories relate to business processes and how information categories must be interconnected to support the business. An information architecture provides a guide for applications development. It facilitates the integration and sharing of data among applications. An information architecture has become critical as systems development decentralizes to business divisions and departments. Its global scope, its unstructured nature, and the lack of available expertise in strategic data planning make this a difficult and troublesome issue.

Measuring Effectiveness: Measuring information systems effectiveness and productivity was ranked ninth in importance. Measurement has long been a problem for IS executives. While measurement of performance is crucial for sound management, few concrete measures exist for assessing the health of the IS organization. While costs are relatively straightforward to establish, benefits continue to be difficult to quantify. Underlying the problem is the IS profession's inability to establish and quantify the value of information. Meanwhile, measurement continues to be a critical problem as organizations invest more and more money in information systems.

Integrating Information Technologies: Integrating data processing, office automation, factory automation, and telecommunications was ranked tenth in importance. In 1986, factory automation (FA) joined the triad of data processing (DP), office automation (OA), and telecommunications (TC) as an issue to be reckoned with by the IS executive. While capability exists to integrate systems designed to support the office and the factory with traditional data processing systems, a number of diverse and rapidly changing technologies are involved. The technical issues involved are difficult to overcome. Many organizational, managerial and political problems also remain to be solved.

Selecting ten issues for ranking is somewhat arbitrary. Obviously, the top ten issues do not have

a monopoly on importance. The importance of a given issue necessarily varies from industry to industry and firm to firm. A number of the other issues which were examined and ranked in the study deserve close scrutiny.

An issue which deserves special mention as runner-up to the top ten is *telecommunications*. Planning, implementing and managing telecommunications was ranked eleventh in importance. Factors such as AT&T's breakup, rapid technological change, and use of telecommunications for competitive advantage are likely contributors to telecommunications high ranking. With 53% of the IS executives ranking it in their top ten, it was the only issue which came close to the top ten.

Movement Toward Consensus

The Delphi method was employed in the research because it assists a diverse group of individuals in approaching consensus on a set of issues. The round-by-round data from the study was examined to determine how much consensus existed on the makeup of the top ten issues. The primary method for establishing the group ranking for each round was mean rank score. In most cases, mean rank scores moved consistently toward consensus over the three rounds. Appendix B provides complete round-by-round data on mean rank, and other statistics. A secondary method for establishing group ranking was the percentage of respondents ranking an issue in the top ten. Higher percentages indicate greater consensus. Percentage scores steadily increased over the three rounds of the survey. While none of the issues achieved perfect consensus, the leading four issues achieved scores of over 90%. All of the issues in the top ten were above the 60% consensus level. Standard deviation of mean rank also declined over the three rounds supporting the hypothesis that the Delphi approach aided IS executives in approaching consensus.

The level of agreement on the final rankings can also be tested statistically. Kendall's Coefficient of Concordance (W) is a measure designed to determine the degree to which a set of ranking scores agree [6]. It is particularly appropriate for this study since it is not sensitive to ties in the ranking. Kendall's W is equivalent to the average Spearman's Correlation (r_s) between all possible

pairs of rankings by the respondents. A high and significant W means that the participants are applying essentially the same standard in judging the importance of the issues. For the final round, W was calculated ($W = 0.618$, $r_s = 0.612$) and found to be statistically significant (at $p < 0.001$).

While the level of consensus grew over the course of the study, it should not be assumed that further rounds would have led to more consensus. Perfect consensus would probably never have been achieved. Even though consensus might have grown marginally, the researchers were convinced that sufficient consensus had been reached to diminish the value of additional rounds.

Discussion

Comparison with 1983

While seven of the top issues from 1983 have remained in the top ten, three new issues in the top ten rose from obscurity. The new issues—competitive advantage, IS's role and contribution, and information architecture—have already been discussed in detail. The ordering within the top ten has also changed substantially since 1983. Table 3 provides a summary of the key issues for the 1986 and 1983 studies. It shows the change in nominal rank over a three-year period. Only issues which have changed by more than three ranks and were in the top ten in 1983 are discussed below.

Of the seven issues remaining in the top ten from 1983, three issues have dropped in importance. *End-user computing* fell from second to sixth in importance. This drop seems to reflect the increased experience most IS executives now have with this issue. End-user computing has spawned a great deal of research and education over the past four years. Information centers have been established by most companies. Users have gained experience and may be doing a better job of planning and avoiding problems. Of course, not all the problems associated with end-user computing have been solved. This is attested to by its still high ranking among the key issues.

Measuring effectiveness fell from fifth to ninth in importance. It is possible that the drop in impor-

tance may be due to a title difference between the 1983 and 1986 instruments. In 1983, the issue was listed as "measuring [and improving] effectiveness and productivity." "Improving" was dropped since it was vague and since it was not supported in the issue's rationale. It is equally plausible that since the measurement problem has frustrated all attempts at solving it, IS executives have begun to devalue its importance. Their chief concern may be shifting toward some of the newer issues. As discussed previously, general managers consistently gave higher ranks to measurement than IS executives. General managers appear to be suggesting that the IS profession must make it a priority to begin to establish valid and reliable measures.

Integrating information technologies (DP, OA, FA and TC) fell from third to tenth in importance. This issue's content has expanded since 1983. Factory automation was not previously included in the issue's title. It was added after the first round of the Delphi, following the advice of several IS executives. A plausible explanation for the large drop in importance for this issue is that real progress toward integration of technologies has been made. While factory automation is still in its infancy in regard to integration with traditional data processing, office automation has declined in importance. Since telecommunications has been recognized as a critical and central issue for many years, it is reasonable to expect progress toward integrating telecommunications and data processing. It is also possible that new issues, such as competitive advantage and information architecture, are simply getting more press and are more salient for IS executives.

Four issues have dropped out of the top ten since 1983 (there was a tie for tenth place). *Human resources* dropped from eighth to twelfth in importance. Human resource issues have been the subject of a steady stream of research and writing over the past ten years. Over that same period, the educational system has steadily increased its production of professionally trained people. This has narrowed much of the gap between the supply and demand for qualified people. Turnover rates for IS professionals have dropped to about one-half of what they were several years ago. While human resource issues remain important from the point of view of IS executives, it seems plausible that substantial progress has been made toward resolving them.

Software development dropped from fourth to thirteenth in importance. It is difficult to explain such a large drop for an issue so central to information systems. A plausible explanation is that IS executives are in the midst of a transition from being managers of technology and applications to becoming full-fledged corporate managers. Thus, IS executives are increasingly focusing their attention on external management issues. Another explanation for the drop is related to the increasing use of packaged applications software in lieu of in-house development. Thus, while the problems associated with software development are not going away, they are being shifted to industry specialists.

Presumably related to the decline in the importance of software development, *managing the applications portfolio* dropped from tenth to sixteenth in importance. This is difficult to explain given the huge investment most organizations have in existing software. Again, if IS executives are making the transition to becoming full-fledged corporate managers, they are increasingly shifting their attention from internal departmental problems to external company-wide problems.

Decision support systems (DSS) dropped from 10th to 23rd in importance. This was the largest change in ranking for any issue in the survey. The issue was dropped from the survey in the final round when only the top twenty issues were retained. Decision support has spawned a great deal of research over the past four years. Also, most IS executives now have at least some experience with developing and implementing DSS. Perhaps the precipitous decline in importance is due to the positive effects of research, education and experience. Just as plausibly, the decline may be due to the profession's propensity to oversell the benefits of new applications. In any case, at least for the respondents in this survey DSS is no longer a key issue.

Office automation dropped from 12th to 21st in importance. Like decision support, the issue was dropped from the survey in the final round. Again, increased experience with office automation may be a major factor in its decline in importance. Another plausible explanation is that many of the issues related to office automation are also bound up in the issue of end-user computing. While both issues declined in impor-

tance, end-user computing declined only four ranks compared to nine for office automation. Comparing the issue rationale for office automation and end-user computing, office automation had a technological focus while end-user computing had more of a managerial focus. The technological focus of the issue could also be partly responsible for the large drop in rank.

Comparison with Other Recent Studies

The results of two other key issue surveys were recently made public. Hartog and Herbert's [4] 1985 Opinion Survey of MIS Managers was published in the *MIS Quarterly* and an updated version of their work also appeared in *Datamation* [5]. Unfortunately, the results of these studies (hereafter referred to as the 1985/86 studies) are not directly comparable with the results of the present research. There are differences in method, issue definition, and respondent coverage. Taken together, these differences make it difficult to compare the results of the studies.

In regard to method, the 1985/86 studies employed only one round of measurement. This made them roughly comparable to the first round of the present research. Indeed, the top ten issues in the 1985/86 studies were nearly identical to the first round Delphi results. This was before new issues had been generated and before peer influence began to have an effect. While one round surveys save time and resources, they do not allow for participant interaction and learning—a major benefit of the Delphi approach. In regard to issue definition, the 1985/86 studies did not consider several of the top ten issues in the present study. In regard to respondent coverage, the 1985/86 studies included a substantial proportion of IS managers reporting below the level of chief IS executive.

Despite methodological differences, however, it is still useful to look at the major differences in findings. In the 1985/86 studies, *Software Development*, *Security & Control* (Data Security), *Data Integrity & Quality* (Quality Assurance), and *Office Automation* were rated much higher than in the present study. Conversely, *Competitive Advantage* (Strategic Systems), *End-User Computing*, and *Measuring Effectiveness* (Measuring Productivity) were rated much lower. A plausible

explanation for these differences is the level of managers responding to the studies. Although specific position data was not provided in reports on the 1985/86 studies, it appears that many IS department managers were involved as respondents. IS department managers in systems development, operations, and technical support might be expected to rank issues related to their unit's mission as critically important. Thus, a manager of technical support would be more likely to rank data security and quality assurance in their top ten than would a chief IS executive. Unfortunately, the 1985/86 studies did not report survey data by position making further analysis of differences speculative.

Historical Trends

To get a better perspective on historical trends in importance rankings, data from a key issues study conducted in 1980 [1] was analyzed as part of the study. Fortunately, the issues developed for the 1980 study map reasonably well to the issues used in the 1983 and 1986 Delphi studies (see Appendix C for details on the mapping). It is also fortunate that the 1980 study involved the SIM membership. A difference, however, is that the 1980 study involved a lower percentage of chief IS executives (approximately 50%). Thus, the 1980 data were influenced more by IS department managers than the 1983/86 data. As discussed above, this difference suggests caution in interpreting trends in the data.

IS management issues can be classified into two general categories. About half are predominantly concerned with management and enterprise related problems. The remaining issues are predominantly concerned with technology and application related problems. Issues such as strategic planning, competitive advantage, and organizational learning fall clearly into the management/enterprise category. Issues such as telecommunications, software development, and artificial intelligence fall clearly into the technology/application category. A few issues do not fall neatly into either category. Issues such as end-user computing and integration of technology have strong management *and* technology components. In these cases, the assignment of category is largely a matter of degree. The "issue type" column in Table 2 shows how the issues were classified by the researchers.

Table 2. Comparison of Key Issues in 1986 and 1983

IS Rank 1986	IS Rank 1983	Three-Year Change	Description of Issue	Issue Type
1	1	0	Strategic Planning	M/E
2	N/A	new	Competitive Advantage	M/E
3	6	+3	Organizational Learning	M/E
4	15	+11	IS's Role & Contribution	M/E
5	7	+2	Alignment in Organization	M/E
6	2	-4	End-User Computing	M/E
7	9	+2	Data as Corporate Resource	M/E
8	N/A	new	Information Architecture	M/E
9	5	-4	Measuring Effectiveness	M/E
10	3	-7	Integrating DP, OA, FA, TC	T/A
11	13	+2	Telecommunications	T/A
12	8	-4	Human Resources	M/E
13	4	-9	Software Development	T/A
14	N/A	new	Multi-Vendor Integration	T/A
15	18	+3	Artificial Intelligence	T/A
16	10	-6	Applications Portfolio	T/A
17	N/A	new	Factory Automation	T/A
18	14	-4	Security & Control	T/A
19	N/A	new	Packaged Software	T/A
20	16	-4	IS's Funding Level	M/E
21	12	-9	Office Automation	T/A
22	N/A	new	Data Integrity & Quality	M/E
23	10	-13	Decision Support Systems	T/A
24	19	-5	Data & Document Storage	T/A
25	17	-8	Computer Graphics	T/A
26	N/A	new	Relational DBMS	T/A

Notes:
M/E concerned predominantly with management and enterprise-wide problems
T/A concerned predominantly with technology and application related problems
N/A issue was not ranked in 1983 study

Classified according to category, it is insightful to look at the historical trends in importance rankings. Figures 2 and 3 graphically portray six-year trends for the top ten issues in each category. Two major trends are evident. First, management/enterprise issues have increased in importance. Figure 2 suggests that the management/enterprise issues which were important in 1980 have held their importance. Strategic planning, for example, has remained a chief concern. Organizational learning and organizational alignment have risen steadily in importance. Other management-enterprise issues have remained in or near the top ten. New management/enterprise issues have also gained importance rapidly.

Second, technology/application issues have steadily declined in importance. Figure 3 suggests that many technology/application issues which were important in 1980 are no longer critical to IS executives. The importance of issues such as decision support and office automation have declined dramatically. The trends for issues such as systems development, applica-

tions portfolio, and security are mixed but also appear to be declining. Newer technology/application issues such as artificial intelligence, multi-vendor integration, and factory automation have not risen as sharply as the new management/enterprise issues. Among the technology/application issues, only telecommunication appears to be holding a position of importance.

Several years ago, Ives and Olson asked whether the typical IS executive was a manager or a technician. Their research [7] suggested that IS executives had made the transition from technician to manager. The research suggested that specialized staff were replacing much of the IS executive's need for hands-on technical skills. The research revealed that IS executives spent a large proportion of their time dealing with management issues within their own departments. Human resource issues, for example, were found to demand a great deal of time. Interestingly, the research also revealed that IS executives spent very little time outside of their own departments.

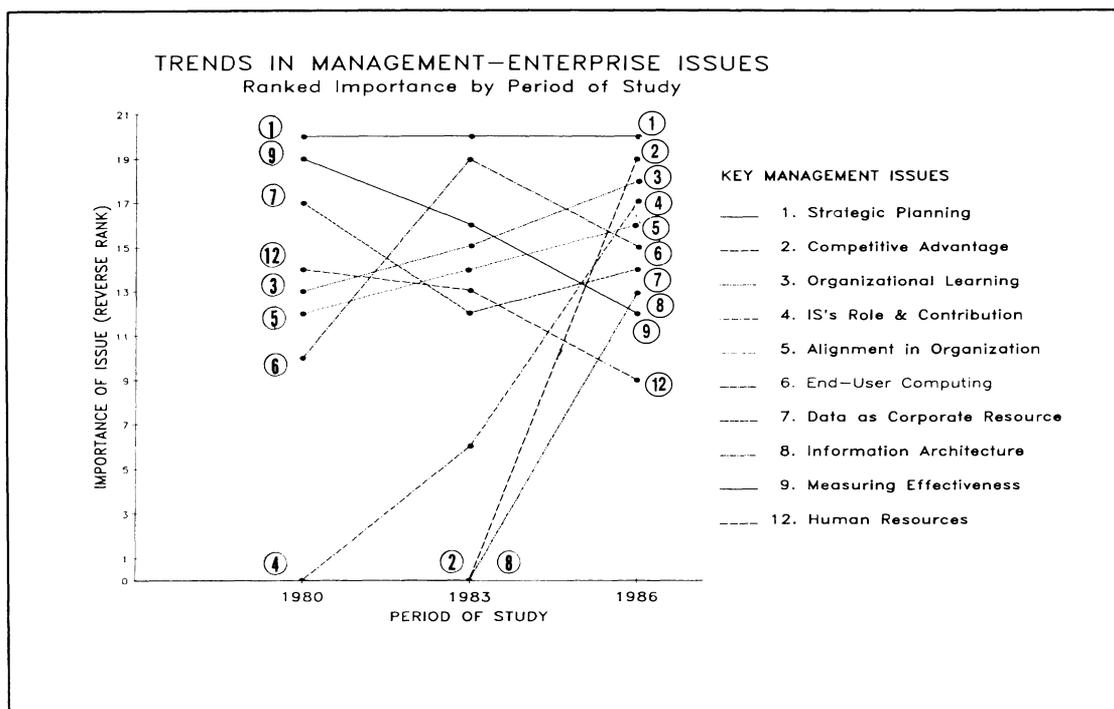


Figure 2. Trends in Management/Enterprise Issues

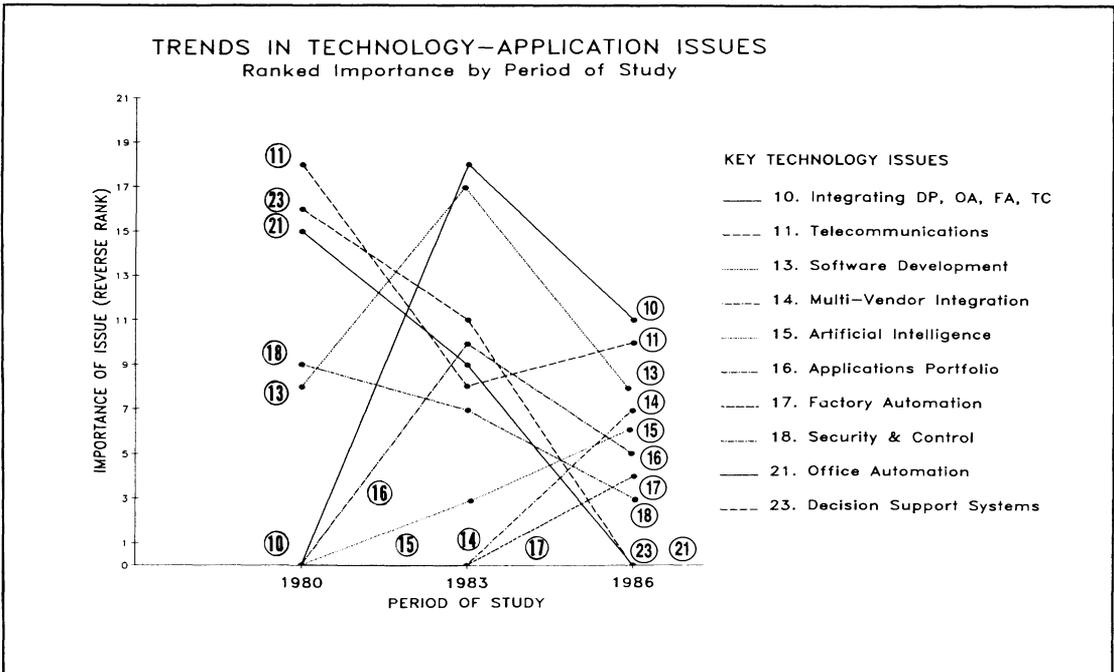


Figure 3. Trends in Technology/Application Issues

The dominance of enterprise issues in this survey was somewhat surprising. Upon closer examination, however, many of the pressures on IS executives reported in this study were predicted several years ago in a position paper commissioned by SIM [9]. The research suggested that by 1985, IS executives would need executive-level skills to cope with their environment. Since enterprise issues now dominate their concerns, IS executives should expect to have command of the types of skills possessed by other general managers. To become a corporate general manager, the IS executive must possess considerable political, organizational, and communication skills. Since the job focuses increasingly on external issues, the IS executive must be involved in and have experience in the company's business. Since it is impossible to remain expert in all technologies, the IS executive must be a manager of managers.

Comparison with General Managers

As discussed in the introduction, this study included a separate survey of the key issues as perceived by corporate general managers. Unfortunately, it is difficult to get top-level execu-

tives to participate in research outside of their professional affiliation. Consequently, the sample size of the general manager group was limited (N = 21 and N = 12). Differences between IS executive rankings and general managers rankings must therefore be interpreted with caution. However, since data of this kind has not been previously reported in the literature and since it influenced the results of the study, some discussion is warranted.

While IS executives and general managers reached consensus about the top ten issues in information systems, there was some disagreement between the two groups about the overall order of importance across those issues (Kendall's Tau Coefficient was statistically significant at $p > 0.001$). Comparing the issues individually, only one of the differences in ranking was statistically significant (Mann-Whitney U-Test significant at $p > 0.01$).

Measuring effectiveness is the issue over which IS executives and general managers disagreed most. General managers consistently gave higher ranks to measurement than IS executives. In the second round, for example, general managers ranked measurement sixth in importance while IS executives ranked it eleventh. The

general managers' high ranking appeared to be responsible for shifting opinion among the IS executives in the final round. In the final round, the issue moved up from eleventh to ninth. Despite this, the IS executive rankings of measurement had a relatively high standard deviation and relatively low percentage score. This suggests considerable disagreement about its importance.

Comments About the Future

Caution is warranted in interpreting the key issues framework. While it is useful to make a periodic assessment of what IS professionals feel are the profession's most critical issues, it is often the less obvious problems that become major concerns. What is important in information systems at any given time is dependent on the complex and turbulent web of technology and environment. In the early part of this decade, the abrupt rise in importance of end-user computing caught much of the IS community by surprise. More recently, using IS for competitive advantage has come to the forefront. What new issues will surface by the end of the decade? Which issues will decline in importance?

While the key issue framework is based on a three- to five-year projection, the executives participating in the study were undoubtedly influenced by their immediate problems and concerns. It is difficult to predict what the planned replication of this study in 1989 will find. One clue is suggested by historical data. Experience with past studies of this kind suggests that many narrow, specific issues have evolved from the broader, global issues. Thus, contemporary concerns over gaining competitive advantage seem to have evolved from long-standing concerns about strategic planning. Current concerns over information architecture seem to have roots in long-standing concerns about systems development and data resource management.

Examining the 1986 key issues framework, one can ask what new issues might evolve from the highly ranked global issues of organizational learning, data as a corporate resource, or measuring effectiveness? If history repeats itself, the narrow issues thus derived may become very important but will tend to be short-lived compared to their broad global counterparts. Decision support systems and office automation are exam-

ples of issues which were once prominent in the key issues framework. Over the past several years, these issues have declined in importance or have been replaced by a broader framing of the issue. On the other hand, one cannot help but be struck by the long-lived nature of some issues. The IS executive may find that issues such as strategic planning, organizational learning, organizational alignment, data resource management, and measurement will remain to spawn new issues for many years to come.

A decade ago, astute IS executives were making the transition from managing technology to managing their departments. Now, facing issues such as competitive advantage, organizational learning, and end-user computing they must make the transition from managing their departments to becoming members of the top management team of the organization.

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An overview of this article will appear in an upcoming issue of *Spectrum*.

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Appendix A: Sample Survey Instrument (Round One)

What do you consider to be the ten most critical issues facing IS executives over the next three to five years? Please indicate your views by ranking the ten most critical issues using the numbers 1 to 10, where 1 indicates the highest priority issue. Use the space below to assign your rankings. Please feel free to change the wording of the issues or modify the rationale. Space is also provided at the end of the form to write in additional issues.

Your

Ranking Key Issues and their Rationale:

_____ Issue: Managing the Impact of Artificial Intelligence

Rationale: AI may prove to be a major force transforming IS and its parent organization. Too little is known about managing this increasingly feasible technology.

_____ Issue: Making Effective Use of Computer Graphics

Rationale: Graphics offers an effective way to present information. Problems need to be resolved in using them interactively and remotely, and integrating them with available reporting mechanisms.

_____ Issue: Increasing Understanding of the Role and Contribution of IS

Rationale: IS is often viewed as an overhead expense with no appreciation of its contributions to the organization. This can lead to inadvertent cuts in funding and limit the use of IS as a competitive weapon.

_____ Issue: Planning and Implementing a Telecommunications System

Rationale: Communication is the lifeblood of the organization. Rapid and major changes in the industry make this task a formidable one.

_____ Issue: Improving Information Security and Control

Rationale: As organizations become increasingly dependent on IS, there is a greater risk of disclosure, destruction and alteration of data, and disruption of information services.

_____ Issue: Improving IS Strategic Planning

Rationale: It is increasingly critical to an organization's success that it can integrate strategic and information systems planning and make competitive use of changing information system technologies.

Appendix A: Sample Survey Instrument (Round One)

Your

Ranking Key Issues and their Rationale:

_____ Issue: Facilitating and Managing End-User Computing

Rationale: The proliferation of end-user computing through personal computers and information centers offers the promise of improved productivity but also the dangers of poor management control of a powerful resource.

_____ Issue: Integrating Data Processing, Office Automation, and Telecommunication.

Rationale: The capability now exists to integrate systems that are based on these diverse technologies. Planning and management problems remain.

_____ Issue: Planning and Management of the Applications Portfolio

Rationale: The applications portfolio is rapidly increasing in size, complexity, and resulting maintenance cost. Despite the longevity of the maintenance problem, too little is known about managing it effectively.

_____ Issue: Measuring IS Effectiveness and Productivity

Rationale: The measurement of IS performance is crucial to its effective management. This is becoming more important as organizations invest more and more money in this area.

_____ Issue: Improving the Quality of Software Development

Rationale: The application development backlog remains at unacceptably high levels. Users are getting impatient. Add to this the increasing costs of systems development personnel, and the need for improved systems development is clear.

_____ Issue: Determining Appropriate IS Funding Levels

Rationale: There is no generally accepted way of establishing the level of IS funding relative to the other funding needs of the organization. This can put both IS and general managers at a disadvantage.

_____ Issue: Managing Data and Document Storage

Rationale: There is a need to provide for the massive data and document storage requirements that will be needed in the near future.

Appendix A: Sample Survey Instrument (Round One)

Your

Ranking Key Issues and their Rationale:

_____ Issue: Planning, Implementing, and Managing Office Automation

Rationale: Office automation is being implemented by many organizations to improve “white collar” productivity. Problems arise in determining how this should be done and what the role of the IS department should be.

_____ Issue: Facilitating Organizational Learning and Use of IS Technologies

Rationale: The organizations that will prosper are those that can integrate appropriate new information system technologies into the operation of their entire organization.

_____ Issue: Developing and Implementing Decision Support Systems

Rationale: Improving the effectiveness of managers is an important objective for information systems. There has been much promise but too little success in this area.

_____ Issue: Making Effective Use of the Data Resource

Rationale: The organization’s data resource is growing in size, complexity, and value. Despite this, it remains largely underutilized.

_____ Issue: Specifying, Recruiting, and Developing Human Resources for IS

Rationale: Current and future shortages of qualified information systems personnel threaten the IS department’s ability to keep up with the information needs of its parent organization.

_____ Issue: Aligning the IS Organization with that of the Enterprise

Rationale: The effectiveness with which the IS organization can support the enterprise’s information needs is affected by the IS department’s position within the overall organization of the enterprise.

(Note: Space was also provided for respondents to write in additional issues of key concern but were not listed in the instrument.)

Appendix A: Sample Survey Instrument (Round Two)

In the first round of the 1986 SIM/MISRC Key Information Systems Issues Survey chief information systems officers indicated that the following were the most critical issues facing them over the next three to five years. The issues are listed in rank order. The issues labeled NEW ISSUE in '86 were not among the key issues formulated in the original study in 1983.

Group Rank	Your Rank	Key Issues
1	_____	Improving IS Strategic Planning
2	_____	Increasing Understanding of Role and Contribution of IS
3	_____	Aligning the IS Organization with that of the Enterprise
4	_____	Promoting Effective Use of the Data Resource
5	_____	Facilitating and Managing End-User Computing
6	_____	Integrating Data Processing, Office Automation, Factory Automation, and Telecommunications
7	_____	Measuring IS Effectiveness and Productivity
8	_____	Planning, Implementing, and Managing Telecommunications
9	_____	Improving the Effectiveness of Software Development
10	_____	Specifying, Recruiting, and Developing IS Human Resources
11	_____	Planning and Management of the Applications Portfolio
12	_____	Determining Appropriate IS Funding Levels
13	_____	Improving Information Security and Control
14	_____	Managing the Impact of Artificial Intelligence
15	_____	Planning, Implementing, and Managing Office Automation
16	_____	Developing and Implementing Decision Support Systems
17	_____	Managing Data and Document Storage
18	_____	Making Effective Use of Computer Graphics
NEW ISSUE in '86	_____	Using Information Systems for Competitive Advantage
NEW ISSUE in '86	_____	Developing an Information Architecture
NEW ISSUE in '86	_____	Selecting and Integrating Packaged Applications Software
NEW ISSUE in '86	_____	Planning, Implementing, and Managing Factory Automation
NEW ISSUE in '86	_____	Converting to and Using Relational DBMS
NEW ISSUE in '86	_____	Enabling Electronic Data Interchange and Multi-Vendor Integration
NEW ISSUE in '86	_____	Improving Data Integrity and Quality Assurance

Appendix A: Sample Survey Instrument (Round Three)

Please look at both IS executive's and general manager's rankings. The issues are listed in order by IS executive ranking. RANK ONLY YOUR TOP 10 ISSUES. A rank of 1 indicates your most critical issue.

IS Executives Rank Round 2	General Mgrs. Rank Round 2	Your Final Rank	Key Issues
1	1	___	Improving IS Strategic Planning
2	5	___	Increasing Understanding of Role and Contribution of IS
3	3	___	Facilitating Organizational Learning and Use of IS
4	2	___	Using Information Systems for Competitive Advantage
5	7	___	Aligning the IS Organization with that of the Enterprise
6	9	___	Promoting Effective Use of the Data Resource
7	11	___	Developing an Information Architecture
8	4	___	Facilitating and Managing End-User Computing
9	8	___	Integrating Data Processing, Office Automation, Factory Automation, and Telecommunications
10	10	___	Planning, Implementing, and Managing Telecommunications
11	6	___	Measuring IS Effectiveness and Productivity
12	14	___	Specifying, Recruiting, and Developing IS Human Resources
13	12	___	Improving the Effectiveness of Software Development
14	17	___	Enabling Electronic Data Interchange and Multi-Vendor Integration
15	23	___	Planning and Managing the Applications Portfolio
16	22	___	Planning, Implementing, and Managing Factory Automation
17	13	___	Determining Appropriate IS Funding Levels
18	16	___	Selecting and Integrating Packaged Applications Software
19	19	___	Improving Information Security and Control
20	21	___	Managing the Impact of Artificial Intelligence

Appendix B: Ranking Data By Delphi Round (IS Executives)

IS Final Rank	Description of Issue	IS Executive Response								
		– Round One –			– Round Two –			– Round Three –		
		Mean Rank	Std Dev	Percent Top Ten	Mean Rank	Std Dev	Percent Top Ten	Mean Rank	Std Dev	Percent Top Ten
1	Strategic Planning	6.1	3.76	85.6	7.0	3.32	85.7	8.6	2.60	95.6
2	Competitive Advantage	– new issue –			4.7	4.14	64.3	7.4	2.49	94.1
3	Organizational Learning	4.6	3.54	76.7	4.8	3.60	75.0	7.0	2.18	98.5
4	IS's Role & Contribution	4.8	3.94	72.2	5.2	3.99	69.6	6.6	2.95	92.6
5	Alignment in Organization	4.5	3.95	67.8	4.5	4.06	60.7	4.9	2.87	86.8
6	End-User Computing	3.6	3.14	75.6	2.8	2.82	67.9	3.8	2.50	85.3
7	Data as Corporate Resource	4.1	3.58	66.7	3.6	3.65	60.7	3.6	2.64	77.9
8	Information Architecture	– new issue –			3.2	3.62	50.0	2.9	2.69	75.5
9	Measuring Effectiveness	3.1	3.24	57.8	2.4	2.74	58.1	2.6	2.83	60.3
10	Integrating DP, OA, FA, TC	3.4	3.36	67.8	2.6	2.92	58.9	2.2	2.19	67.6
11	Telecommunications	2.7	3.32	47.8	2.5	2.88	55.4	1.4	1.84	52.9
12	Human Resources	2.4	3.28	44.4	1.5	2.26	41.1	1.2	2.22	33.8
13	Software Development	2.6	3.01	48.9	1.5	2.75	30.4	0.8	1.86	23.5
14	Multi-Vendor Integration	– new issue –			1.0	2.15	25.0	0.5	1.61	13.2
15	Artificial Intelligence	1.8	2.68	51.1	0.6	1.75	16.1	0.4	1.29	10.3
16	Applications Portfolio	2.3	3.01	51.1	1.0	2.28	21.4	0.3	1.20	8.8
17	Factory Automation	– new issue –			0.9	2.01	21.4	0.2	1.00	7.4
18	Security & Control	1.9	2.78	45.6	0.7	1.64	17.9	0.2	0.88	5.9
19	Packaged Software	– new issue –			0.8	1.88	21.4	0.1	0.70	5.9
20	IS's Funding Level	2.1	3.09	37.8	0.9	1.88	21.4	0.1	0.52	4.4
NR	Office Automation	1.3	2.28	32.2	0.6	1.51	17.9	– dropped –		
NR	Data Integrity & Quality	– new issue –			0.6	1.55	16.1	– dropped –		
NR	Decision Support Systems	1.3	2.33	34.4	0.4	1.51	12.5	– dropped –		
NR	Data & Document Storage	0.9	2.37	16.7	0.4	1.63	8.9	– dropped –		
NR	Computer Graphics	0.5	1.54	10.0	0.3	1.14	8.9	– dropped –		
NR	Relational DBMS	– new issue –			0.3	1.40	7.1	– dropped –		

Notes:

NR indicates issue listed was not ranked in final round

N = 90 for round one; N = 56 for round two; N = 68 for round three

Appendix B: Ranking Data By Delphi Round (General Managers)

GM Final Rank	Description of Issue	General Manager Response					
		–Round One–			–Round Two–		
		Mean Rank	Std Dev	Percent Top Ten	Mean Rank	Std Dev	Percent Top Ten
1	Strategic Planning	6.5	4.20	81.0	9.7	0.65	100.0
2	Competitive Advantage	5.8	3.89	81.0	8.1	2.15	100.0
3	Organizational Learning	4.2	3.53	71.4	6.1	2.94	91.7
4	Measuring Effectiveness	4.0	3.44	76.2	5.4	3.06	91.7
5	IS's Role & Contribution	4.1	3.71	61.9	5.2	2.92	83.3
6	End-User Computing	4.2	3.37	76.2	4.8	2.76	91.7
7	Alignment in Organization	3.6	3.83	57.1	4.0	2.73	75.0
8	Data as Corporate Resource	2.4	2.73	61.9	2.5	2.54	66.7
9	Information Architecture	2.3	3.27	42.9	2.2	2.18	75.0
10	Integrating DP, OA, FA, TC	3.0	3.06	61.9	2.2	2.73	59.3
11	Telecommunications	2.3	3.24	47.6	1.6	1.44	66.7
12	Software Development	1.8	2.99	38.1	1.3	2.15	33.3
13	Human Resources	1.3	2.39	33.3	1.0	1.54	33.3
14	Factory Automation	0.6	1.47	14.3	0.7	2.02	16.6
15	Applications Portfolio	0.6	1.91	9.5	0.3	0.87	8.3
16	Multi-Vendor Integration	0.8	2.41	9.5	0.1	0.29	8.3
NR	Artificial Intelligence	0.6	1.96	9.5	0.0	0.00	0.0
NR	Security & Control	0.6	1.28	23.8	0.0	0.00	0.0
NR	Packaged Software	0.9	2.13	19.0	0.0	0.00	0.0
NR	IS's Funding Level	1.7	2.92	28.6	0.0	0.00	0.0
NR	Office Automation	1.3	2.73	23.8		– dropped –	
NR	Data Integrity & Quality	0.6	1.86	14.3		– dropped –	
NR	Decision Support Systems	0.0	0.22	4.8		– dropped –	
NR	Data & Document Storage	0.0	0.22	4.8		– dropped –	
NR	Computer Graphics	0.2	1.09	4.8		– dropped –	
NR	Relational DBMS	0.8	2.43	9.5		– dropped –	

Notes:

NR indicates issue listed was not ranked in final round

N = 21 for round one; N = 12 for round two

Appendix C. Mapping From 1980 Study to 1983/86 Issues

1980 Study Issue Description	Maps to 1983/86 Issue
1. MIS Long Range Planning and Integration	Strategic Planning
2. Gauging MIS Effectiveness	Measuring Effectiveness
3. Impact of Communications on MIS	Telecommunications
4. Developing Role of Information Resource Manager	Data as Corporate Resource
5. Decision Support Systems	Decision Support Systems
6. Office of the Future Management	Office Automation
7. Employee Training and Career Path Development	Human Resources
8. Education of Non-MIS Management	Organizational Learning
9. Centralization vs. Decentralization of MIS Functions	Alignment in Organization
10. Employee Job Satisfaction	Human Resources
11. Providing End Users with Own Development Systems	End-User Computing
12. Problems of Maintaining Data Security	Security & Control
13. Impact of Software Engineering on MIS	Systems Development
14. Problems of Maintaining Information Privacy	Data Integrity & Quality
15. Management Science and the MIS Environment	— no comparable issue—
16. Professional Recruitment	Human Resources
17. MIS Ethics	— no comparable issue—
18. Impact of Personal Computers on Institution	End-User Computing

Notes:

Data for 1980 study was collected in 1980, published in 1982 [1]

Data for 1983 and 1986 studies are based on same issue descriptions

Appendix C. Comparison of Key Issues from 1980, 1983, and 1986 Studies

Description of Issue	Nominal Ranking of – Importance of Issue –		
	1980	1983	1986
Strategic Planning	1	1	1
Competitive Advantage	NR	NR	2
Organizational Learning	8	6	3
IS's Role & Contribution	NR	15	4
Alignment in Organization	9	7	5
End-User Computing	11	2	6
Data as Corporate Resource	4	9	7
Information Architecture	NR	NR	8
Measuring Effectiveness	2	5	9
Integrating DP, OA, FA, TC	NR	3	10
Telecommunications	3	13	11
Human Resources	7	8	12
Software Development	13	4	13
Multi-Vendor Integration	NR	NR	14
Artificial Intelligence	NR	18	15
Applications Portfolio	NR	11	16
Factory Automation	NR	NR	17
Security & Control	12	14	18
Packaged Software	NR	NR	19
IS's Funding Level	NR	16	20
Office Automation	6	12	NR
Data Integrity & Quality	14	NR	NR
Decision Support Systems	5	10	NR
Data & Document Storage	NR	19	NR
Computer Graphics	NR	17	NR
Management Science & MIS	15	NR	NR
MIS Ethics	17	NR	NR

Notes: 1980 data adapted from Ball & Harris [1]; NR indicates item was not ranked as a key issue