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# Key Information Systems Issues for the 1980's

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## Abstract

*Knowledge of the most important issues in the information systems field would help focus research and educational efforts. A Delphi study, using leading information systems (IS) professionals, was used to identify and rank ten key IS management issues for the 1980's. Measures were also taken of the amount of agreement achieved on these issues and rankings. The number one issue identified was improved IS planning, followed by facilitation and management of end user computing. This article describes the research approach involved and discusses the results.*

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ACM Categories: K.3.2, K.6.0

## Introduction

The information systems profession is continually faced with making difficult decisions about the commitment of its limited management, research, and educational resources. Organizations make judgements about importance when they fund research projects and establish conference themes and topics. Businesses and government agencies make resource decisions that affect their profitability and effectiveness. Many issues exist, but which are the most crucial? A clear identification of key issues would help in decision-making, but a widely accepted and current assessment of the important management issues in information systems does not exist.

In a joint effort to meet this need, the Society for Information Management (SIM) and the MIS Research Center (MISRC) at the University of Minnesota conducted a survey of leading information systems practitioners and academics. The purpose of the study was to answer three questions:

1. What are the ten most important IS management issues as seen by leading information systems professionals?
2. What is the order of importance of these issues?
3. How much agreement do these IS professionals have about these issues?

In answering these questions, this study utilized a Delphi approach to collect and combine the opinions of the many IS professionals who participated. This is a new application for the technique and its contribution to the study findings is also examined.

## The Key Issues

Information systems professionals have individual opinions about what comprise *key* IS management issues. Obtaining a general consensus from a leading group of IS professionals helps to identify key issues for the whole profession. A Delphi survey approach was used to measure this collective view. The final round of the survey included 54 participants, almost all were practitioners at the director, vice-president, or consultant level. There were also four prominent information

**Table 1. Breakout of Respondents By Industry**

Industry	Number	Percent
Manufacturing	25	46.3
Energy	5	9.2
Financial Services	6	11.1
Business Services	10	18.5
Health Services	2	3.7
Education	4	7.4
Transportation	1	1.9
Government	1	1.9
Total	54	100.0%

systems academics. A breakdown of the group by industry is given in Table 1.

The combined opinions of the group on the identification and ranking of issues is given in Table 2. The first ten issues, beginning with improved IS planning and finishing with development and implementation of decision support systems, make up the group's top ten key issues. Note that at least 64% of the respondents selected each issue as a key issue. The selection rate of the eleventh issue is only half that of the tenth, indicating a clear break for the top ten.

The second question concerned the relative importance of these key issues. The listing in Table 2 is ordered by the average rank score given to the issues by the IS professionals. The first two issues listed were clearly most important to the group. Improved IS planning received an average rank score of 9.1 out of a possible 10. The second issue, facilitation and management of end user computing, received an average score of 7.4 out of 10. The respondents ranked the tenth issue much lower, giving it a mean rank score of only 1.5. The ranking was also analyzed by computing median values for the rank scores. As can be seen in the third column of Table 2, these values did not change the order of the issue rankings.

The last question addressed the amount of agreement between IS professionals about these key issues. A Delphi approach was used to increase the level of consensus over what a standard survey would achieve. Some measure of this consensus is found in the standard deviation and interquartile range columns in Table 2. The larger these values are, the less consensus there is

about their ranking. The first issue, improved IS planning, has the most consensus about its ranking, with a standard deviation of only 1.5 and an interquartile range of 1. Add to this, its inclusion by everyone in their top ten list and it can be safely concluded that there was a high level of agreement in the group that planning is their number one issue. There was also much agreement about the low end. In particular, the sixteenth through nineteenth issues were consistently ranked as being less important than other issues.

### Discussion of issue ranking

There are no surprises in this ranking. The first place position of improved IS planning matches the top priority found in a survey by Ball and Harris [1], (see Table 3). This issue's importance is reflected in the significant research efforts and professional programs that have been directed at it. For example, the Society for Information Management selected "Strategic Planning and Information Management" as the topic for its 1982 annual conference. With this widespread recognition of IS planning as a critical issue, it is not surprising to find such a high degree of consensus about its first place ranking.

The importance of facilitating and managing end user computing is also coming to be widely felt. Several of the Ball and Harris issues correspond to parts of this issue, but no clear comparison is possible. The information systems literature, however, indicates an increasing concern about the end user issue [2, 3, 6]. The high level of consensus about this issue in the survey is evidence of its pervasiveness.

Caution should be used in evaluating the final ranking. We often find that it is the less obvious issues that become the biggest concerns. For example, five years before the personal computer emerged as a major force for facilitating end-user computing, there was little discussion or awareness of its potential impact.

One issue that was ranked low, but may become much more important by the end of this decade, is the impact of artificial intelligence (listed 18th in Table 2). While few IS professionals in this survey felt that it was a crucial issue, it is now receiving increasing attention because of the Japanese fifth

Table 2. List of Key IS Management Issues

Group Rank	Issues	Rank Scores				% in Top Ten
		MEAN	SD	MED	IOR	
1.	Improved IS planning	9.1	1.5	10	1	100.0
2.	Facilitation and management of end user computing	7.4	2.1	8	2	100.0
3.	Integration of data processing, office automation, and telecommunications	6.4	2.4	7	3	98.1
4.	Improved software development and quality	6.0	2.6	7	3	92.5
5.	Measuring and improving IS effectiveness/productivity	5.3	3.0	6	3	88.8
6.	Facilitation of organizational learning and usage of information systems technologies	4.7	2.6	5	3	88.8
7.	Aligning the IS organization with that of the enterprise	3.7	2.8	4	4	81.4
8.	Specification, recruitment, and development of IS human resources	2.3	2.0	2	2	75.9
9.	Effective use of the organization's data resources	2.2	2.3	2	3	70.3
10.	Development and implementation of decision support systems	1.5	2.1	1	2	64.8
11.	Planning and management of the applications portfolio	1.5	2.6	0	2	33.3
12.	Planning, implementation, and management of office automation	1.3	2.4	0	3	27.7
13.	Planning and implementing a telecommunication system	.9	2.2	0	0	20.3
14.	Information security and control	.7	1.8	0	0	22.2
15.	Increased understanding of the role/contribution of IS	.7	1.8	0	0	18.5
16.	Determination of appropriate IS funding	.3	1.3	0	0	7.4
17.	Effective usage of graphics	.2	1.2	0	0	5.5
18.	Impact of artificial intelligence	.0	.5	0	0	1.8
19.	Management of data and document storage	.0	.1	0	0	1.8

MEAN: Mean value of rank scores (10 = high, 1 = low, 0 = not in top ten)

SD: Standard deviation of rank scores

MED: Median value of rank scores

IQR: Interquartile range of rank scores (difference between 3rd quartile and 1st quartile)

% in Top Ten: Percentage of respondents who gave the issue a value greater than "0"

**Table 3. Importance of the Issues to the Respondents**

<b>Issue</b>	<b>Mean</b>	<b>Standard Deviation</b>
1. MIS Long Range Planning and Integration	5.13	1.08
2. Gauging MIS Effectiveness	5.01	1.09
3. Impact of Communications on MIS	4.67	1.11
4. The Developing Role of the Information Resource Manager	4.59	1.28
5. Decision Support Systems	4.43	1.31
6. Office of the Future Management	4.39	1.35
7. Employee Training and Career Path Development	4.35	1.31
8. Education of Non-MIS Management	4.35	1.39
9. Centralization vs. Decentralization of MIS Functions	4.29	1.34
10. Employee Job Satisfaction	4.29	1.35
11. Providing End Users with Their Own Development Systems	4.08	1.42
12. Problems of Maintaining Data Security	3.95	1.32
13. Impact of Software Engineering on MIS	3.87	1.38
14. Problems of Maintaining Information Privacy	3.80	1.36
15. Management Science and the MIS Environment	3.77	1.37
16. Professional Recruitment	3.72	1.56
17. MIS Ethics	3.57	1.49
18. Impact of Personal Computers on an Institutional Environment	3.10	1.49

Ball, L., and Harris, R. "SMIS Members: A Membership Analysis." *MIS Quarterly*, Volume 6, Number 1, 1982, pp. 19-38. Reprinted by permission of the Society for Information Management and the Management Information Systems Research Center.

generation computer effort. This push to become a major factor in the computer industry places substantial emphasis on artificial intelligence technologies [4].

In spite of this cautionary note, the list provides a useful framework for encouraging research and educational programs. The IS management issues identified are currently of the highest importance

to the information systems professionals surveyed. These respondents, in turn, represent an important segment of the information systems field. The value of this listing will obviously decline with age. New technologies, economic and legal conditions, and other developments will cause the relative importance of these issues to change and cause new ones to come into existence. Therefore, it is important to stress the need for

periodically updating. How should this measurement and updating be done? The remainder of this article will discuss the use of the Delphi approach to obtain and rank issues.

## Delphi Approach

### *Previous studies*

It is useful to compare the process used here with that of other surveys. In 1980, Ball and Harris surveyed SIM members to determine, in part, what levels of importance they gave to 18 IS management issues. A total of 417 responses were received and analyzed (30% response rate). The set of issues (determined ahead of time by the authors) were rated on a six point Likert-type scale that ranged from "Not Important" (1) to "Very Important" (6). Table 3 shows their ranking of management issues by mean importance rating. Standard deviations were given as measures of agreement among respondents about the rating. The researchers noted that some of the issues' ratings could have been affected by their wording. Since there was only one round of rating, there was no opportunity to use survey feedback to change wordings. Another possible factor influencing results was the inability of the respondents to suggest issues which could be reviewed by the whole group. Perhaps important issues were not included in the list of eighteen created by the researchers.

A much different approach was taken by Martin [5]. In this study, Martin had 15 chief IS executives write down their "Critical Success Factors". These CSF's were then summarized and returned to the same executives for review. The respondents were given the opportunity to change or add to their list of factors and eight of them did so. Table 4 lists the CSF's and the number of executives who mentioned them. The CSF wording and boundaries were determined by the researcher. The resulting definitions of the factors are so different from the issues used in the Ball and Harris study, and those used in the present study, that comparison is difficult. The CSF's tended to be less specific than the issues. It is important to note that substantive changes were made during the second round of the CSF

**Table 4. Martin's Critical Success Factors**

Factor	NO.
1. System development	14
2. Data processing operations	13
3. Human resource development	11
4. Management control of the MIS/DP organization	11
5. Relationships with the management of parent organization	11
6. Support of the objectives and priorities of the parent organization	11
7. Management of change	6
8. Other	8

Data summarized from Martin, E.W. "Critical Success Factors of Chief MIS/DP Executives," *MIS Quarterly*, Volume 6, Number 2, 1982, pp. 1-9.

survey. This suggests that multiple rounds and open issue solicitation may produce different results than those of the Ball and Harris survey.

### *Survey approach*

The Ball and Harris and Martin studies provided valuable information about key IS management issues. The questions raised by their methodologies, however, warranted further investigation. The current study uses a different approach to achieve a similar goal. A professional group (the Society for Information Management's institutional members and prominent academics) contributed first to the creation of a list of key IS management issues and then to the ordering of the issues within the list. A Delphi approach was used not only to identify and rank the issues but also to gain consensus about them. It included an initial open issue solicitation step with multiple rounds of feedback. The study was conducted using mail survey forms (sample is given in appendix A1) in the following four-step process.

**Round One:** Each participant was asked to identify and briefly describe five to ten of what

they consider to be the major IS management issues of the next five to ten years. Each respondent was also asked to contribute a rationale for including each issue. Fifty-two responses were returned to the MISRC and consolidated into a combined list of issues and rationales.

**Round Two:** The combined list was mailed to all participants who were then requested to select the ten most important issues and to prioritize them. One hundred and two rankings were returned to the MISRC and used to determine an aggregate group ranking. The aggregate ranking was used to reorder the list of issues and rationales.

**Round Three:** Each participant was mailed the new list with feedback showing their individual ranking related to the aggregate ranking. Based upon this information, each participant had the opportunity to change their ranks. If their new ranks differed substantially from the group's (i.e., were more than 3 rank scores away), they were asked to provide additional rationales which were to be shared anonymously during round four. This allowed participants to influence rankings by pointing out concerns that others may have overlooked. Sixty-two responses were received. A new aggregate group ranking was established and the rationales were compiled into short lists for each issue.

**Round Four:** The new group ranking, the old group ranking, and both previous individual rankings were sent to continuing participants along with the lists of contributed rationales. Respondents were asked to review the rankings and rationales and then to determine a final ranking. Fifty-four rankings were received and combined to create the final consolidated group ranking of issues.

This process provides a systematic way of exchanging and combining valuable, but often diverse perspectives. All data consolidation and analysis was handled at the MIS Research Center at the University of Minnesota. The survey was conducted over six months in 1982-1983.

### *The ranking process*

The following sections describe the process used for obtaining the key issue ranking. The results of the ranking are interesting and useful, but it is also

important to understand how they were derived. First, the creation of the list of key issues and their rationales is covered. This list was the basis for all of the subsequent steps. Second, the selection and ranking of the top ten IS management issues is presented. Third, the amount of consensus or agreement that was reached by the survey participants is examined, in particular the movement over the three final rounds toward more rank consensus. Finally, the question of "whole" group vs. "final" group response in the second and third rounds is dealt with.

#### **Initial List of Issues and Rationales**

In the first round 52 respondents (N = 52) contributed issues and rationales. These were categorized and summarized into nineteen key issues and rationales by the staff at the MIS Research Center. Substantial judgement was required to define the issue boundaries and to summarize the rationales. The list of issues in their final wording is given in Table 1. The rationales are given on the Survey form in Appendix A1.

The percentage of respondents who mentioned an issue or a sub-issue give some indication of its importance. For example, 58.5% of the respondents to the first round listed improved IS planning, or something like it, as a key management issue. Only 3.8% mentioned effective usage of graphics. (The complete figures are given in Appendix A2.) These percentages could be used to rank the issues but the resultant ranking would require careful interpretation. The substantial judgement required to define the issue boundaries makes these percentages a function of the researchers' categorization as well as of the respondents' preferences. This cautionary note is supported by the substantial changes that occurred between the first and second round rankings. These changes provide justification for the multiple survey rounds of the Delphi approach. The ranking was used in the second round to order the issues for presentation. Participants were not given the percentages, nor were they told that the issues had been ordered in any particular way.

In the second round participants were invited to make comments about the issues and rationales on the list. This was done for two reasons. First, the second round survey forms were sent to *all* of the sample of SIM institutional members and

academics not only to those who responded to the first round. This larger mailing was done to increase the number of participants in the survey. The request for comments was an opportunity for the new respondents to contribute to the identification of issues and rationales. Secondly, this solicitation provided feedback to the researchers on their categorization and summarization of issues. About 15% of the 102 responses to the second round had comments. These suggestions were carefully reviewed and resulted in some minor changes to the wording of the issues and rationales. (All statements of issues and rationales in this article incorporate those changes.)

Many of the comments were concerned with the overlap of issues. The problem faced by the researchers was to create a reasonably short list that was still specific enough to be meaningful. As there was no consensus among respondent recommendations for combining or dividing issues, they were left as they were. Participants in subsequent rounds were asked to rank the issues on their central aspects. For example, the issue concerning the integration of data processing office automation, and telecommunications is focussing on the *integration* aspect. Issues specific to office automation are related and important, but not part of this key issue.

### Selecting and Ranking the Issues

For rounds two, three, and four of the survey, respondents were asked to select the ten most important issues on the list and to rank them accordingly. Participants were to assign the most important issue a score of 10, the second most important 9, and so on down to 1. Issues that were not in the top ten were given a 0 or left blank. If left blank, the researchers later assigned them a 0 for analysis purposes.

The number of responses to the ranking survey declined from a high of 102 in the second round to the 54 who finished the final round. The latter group (N = 54) is the basis of the final issue ranking. As such, this group's data was selected for the principal analyses in this paper. Unless otherwise stated, the data and conclusions refer to the N = 54 group. The final results section discusses differences between the N = 54 group and the larger group.

### Percentage Ranking

The final round percentages of respondents who

selected each issue as one of their top ten is given in Table 2. A complete listing for all the rounds is given in Appendix A2. Note that in the last round both improving IS planning and facilitation and management of end user computing were named by all respondents as a key issue. Figure 1 graphically shows the changes in percentages of the eleven top-rated issue for each of the four rounds of the study. The greatest change in percentages occurred between the first round (the percent mentioned) and the second round (the percent included). In the remaining iterations, all of the percentages gradually moved upward except for the eleventh one (the portfolio issue); which decreased until it was only half of the next higher issue.

### Mean Score Ranking

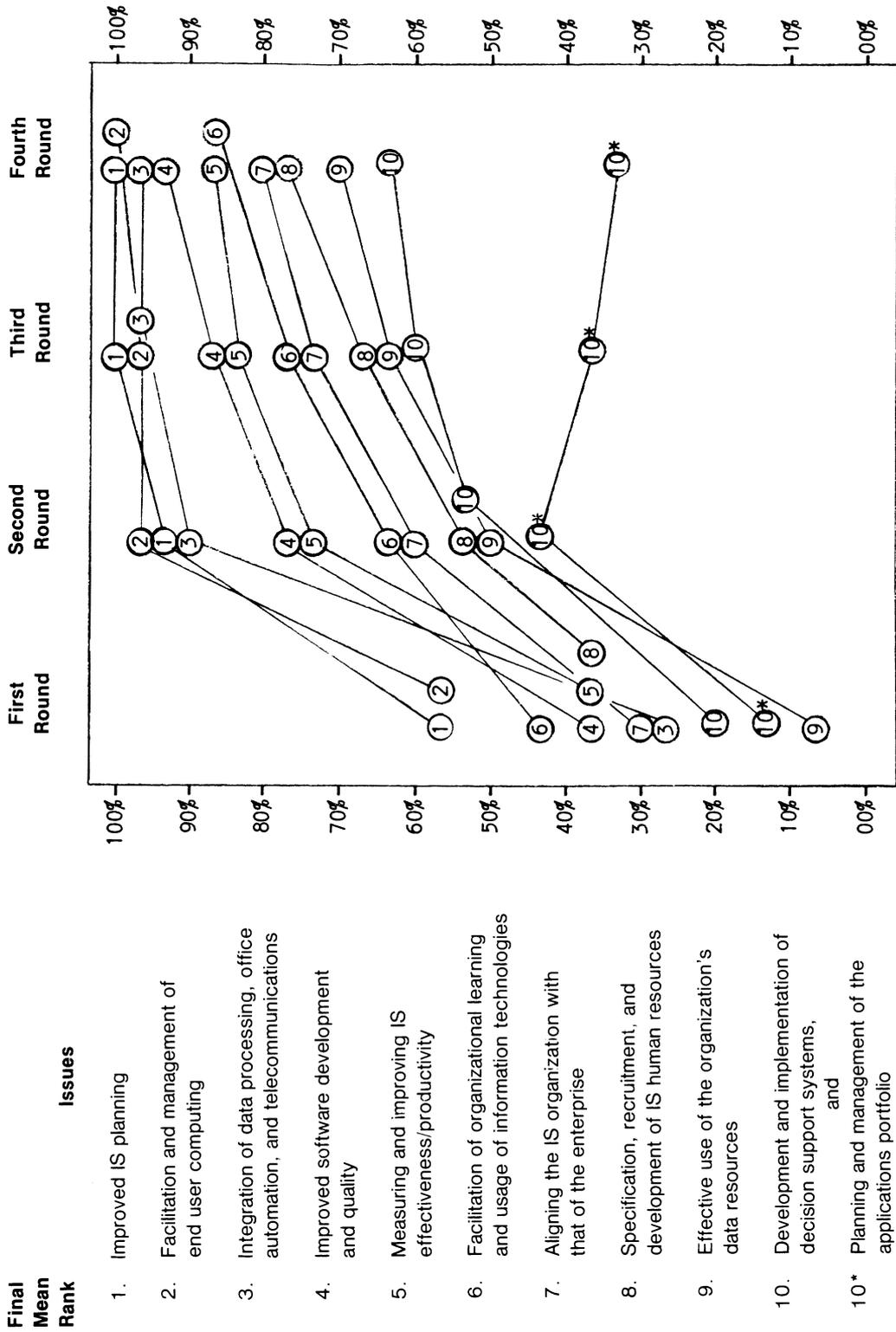
The primary method of establishing the group ranking for this study was the average rank scores. The highest mean rank score for each round was ranked first, the second highest, second, and so on. Table 2 contains the mean rank scores, their standard deviations, and the rankings for the final (N = 54) group for the last round. Appendix A3 gives these values for all three rounds as well as the values of the larger N = 102 (second round) and N = 62 (third round) groups. The ranking that resulted from the fourth round was used to define the final mean ranking that established the final ordering of issues for these discussions. The top ten from this ranking included eleven issues because there was a tie for tenth place between development and implementation of decision support systems and planning and management of the applications portfolio.

Figure 2 (left side) shows graphically how the mean rank scores changed over the three ranking rounds. The results of the fourth round are compared to the rank scores that the issues would have achieved had there been perfect agreement among the participants. Note that average rank scores moved consistently toward these perfect scores indicating an increasing agreement about the ranking of the issues.

### Median Score Ranking

The rank scores contributed by the respondents were required to be whole numbers and all ten ranks had to be assigned. This approach does not allow a participant to say, for example, that the

Figure 1. List of Key IS Management Issue Movement Toward Top Ten Consensus



first rank issue is much more important than the second, and that the second is only slightly more important than the third. S.S. Stevens [7] and others have argued that means and standard deviations are not appropriate statistics for this kind of measurement (i.e., one that uses an ordinal scale). Medians and interquartile ranges are more suitable measures of central tendency and variance, respectively. Medians also provide the advantage of not being as affected by extreme values as arithmetic means. An analysis was done to see if using median rank scores changed the final issue ranking.

Table 1 shows the median rank scores and the quartile rank scores for the last round of the final ( $N = 54$ ) group. Appendix A4 gives these values and their associated ranks for all three rounds. Note that in the final round the same issues that made up the mean rank score top ten are included in the median rank score top ten, with one exception — the tied portfolio issue. The order also has not changed, except that there is now a tie for third and eighth places. The major apparent difference in using the median scores for rankings is the increase in the number of ties. Figure 2 (right side) shows the changes in median scores of the top ten issues over the three final rounds. Like the percentages and mean scores, they appear to be moving toward the perfect agreement scores.

The lower median ranking, and especially the lower percentage of inclusion, suggested that planning and management of the applications portfolio could be dropped from the key issues list. The tie for the tenth position in the mean score ranking appears to be due to a few high ranks rather than to a general consensus opinion.

### **Movement Toward Consensus**

Some evidence of a movement toward consensus has already been presented. Figure 1 shows increasing agreement about which issues to include in the group's top ten. The tenth issue, for example, concerning decision support systems went from only 21% of respondents mentioning it in the first round to almost 63% including it on their lists in the fourth round. The group reached perfect agreement about the inclusion of the IS planning and end user computing issues. The changes in the mean rank scores and the median rank scores illustrated in Figure 2 are also indica-

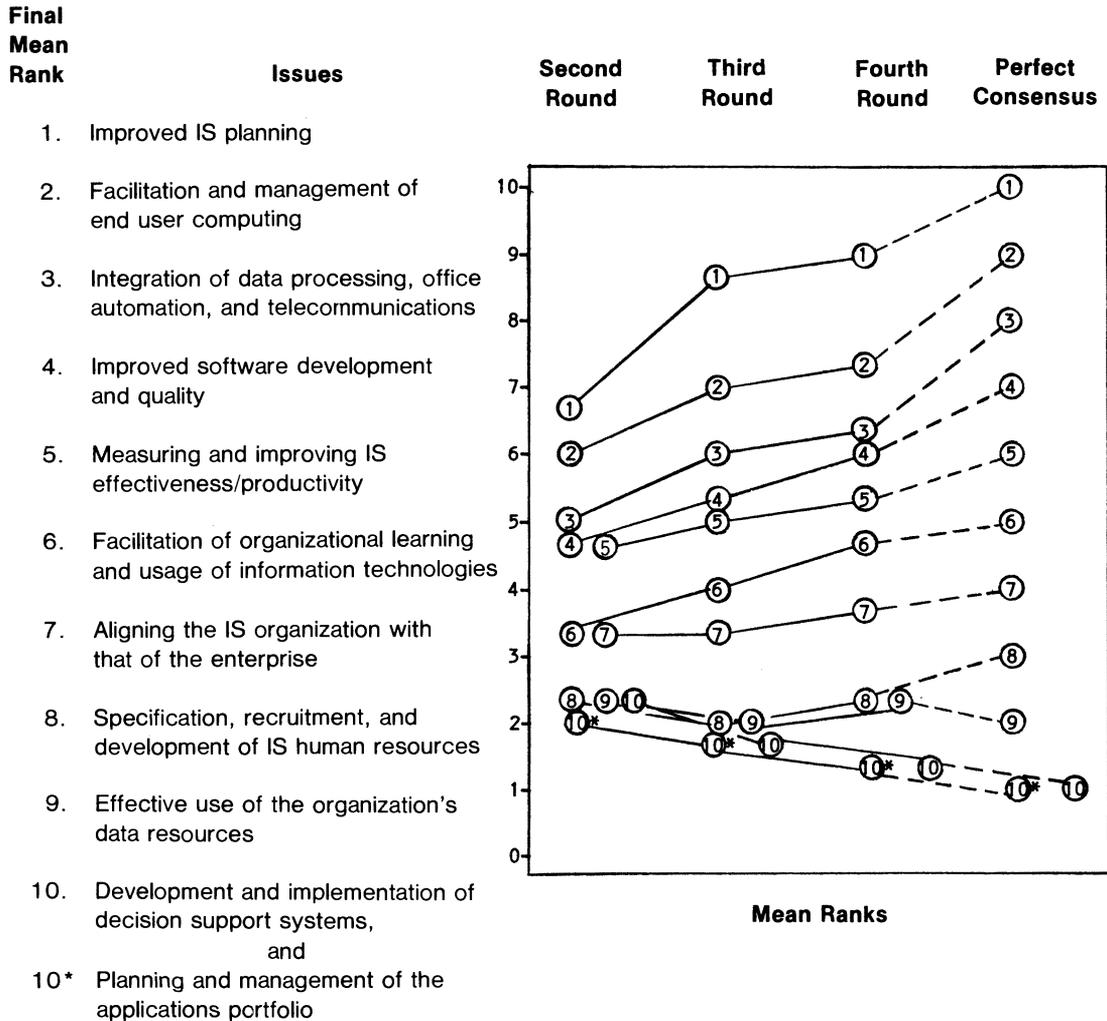
tions of movement toward consensus. From the second through the fourth rounds the means and medians moved toward their perfect consensus scores. Some of the median rank scores exactly equaled their perfect scores.

The measures of central tendency (means and medians) and the percentages can tell only so much about ranking agreement. To find out more we must examine measures of dispersion for the rank scores. Two measures were examined: (1) standard deviations, and (2) interquartile ranges. These measures provide a more precise way to measure rank score consensus. The standard deviation of the rank scores is related to the average of the differences between participants' scores and the group's average score. A decreasing standard deviation indicates a decrease in these differences, i.e., more consensus. If there was perfect consensus, the standard deviation would be 0. Figure 3 (left side) shows the movement of standard deviations toward 0, the perfect consensus value. The figure suggests that most agreement was about the rank score for improved IS planning and the least agreement was about the rank position of measuring and improving IS effectiveness/productivity.

The second measure of dispersion is the interquartile range. This range is the difference between the third quartile (3Q) rank score and the first quartile (1Q) rank score. For example, the fourth round third quartile rank score for the improved IS planning issue is 10. Its first quartile score is 9. The interquartile range is therefore 1 (10 minus 9). Perfect consensus is an interquartile range of 0. Figure 3 (right side) illustrates the movement of the interquartile ranges over the three ranking rounds. As with the standard deviations, there is a movement toward perfect consensus. Again, in the final round there was most agreement about the ranking of improved IS planning and the least about measuring and improving IS effectiveness/productivity.

Substantial consensus was achieved concerning most of the issue ranks. This consensus grew over the course of the Delphi rounds. It should not be assumed, however, that further rounds would lead to more consensus. Perfect consensus would probably never be achieved. Even if consensus improvement could be obtained with more survey rounds the authors are not convinced that it would be worth the effort. The consensus

**Figure 2. List of Key IS Management Issues Movement Toward Ranking Consensus**



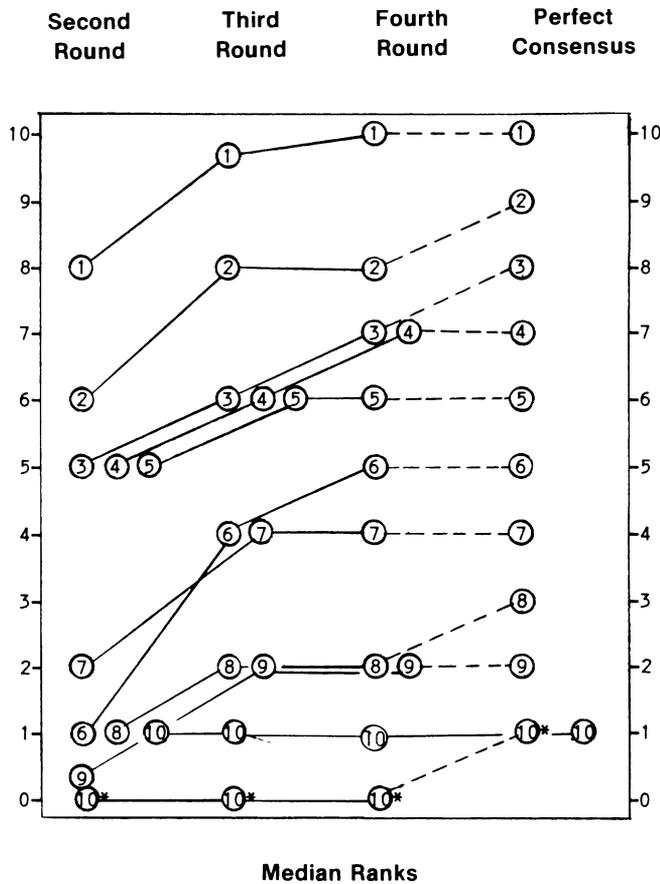
demonstrated above should be sufficient to make the issue ranking credible.

**Whole Group vs Final Group**

The preceding analysis and discussion is based on the group that completed all of the ranking rounds, i.e., the N = 54 group. The authors believe that this is the appropriate group for analysis because it eliminates changes in rankings that are due solely to participants dropping out of the study. The larger groups, however, still played a part in the study. It was the ranking of issues based on the larger groups' mean scores that determined the order of presentation of the

issues and rationales in the next round. It was also this ranking that was the basis for feedback to the respondents on how they compared with the groups' ranking. Therefore, it is worthwhile to briefly examine the larger groups' data.

Appendix A5 contains the ranks, means, and standard deviations for the second and third rounds of the study for both the N = 54 group and the larger two groups. There were very few differences. In the second round the N = 102 group had included the data resource issue in its top ten, while the smaller group did not. It also excluded the office automation issue which the N = 54 group had placed in ninth position. Overall, the mean paired



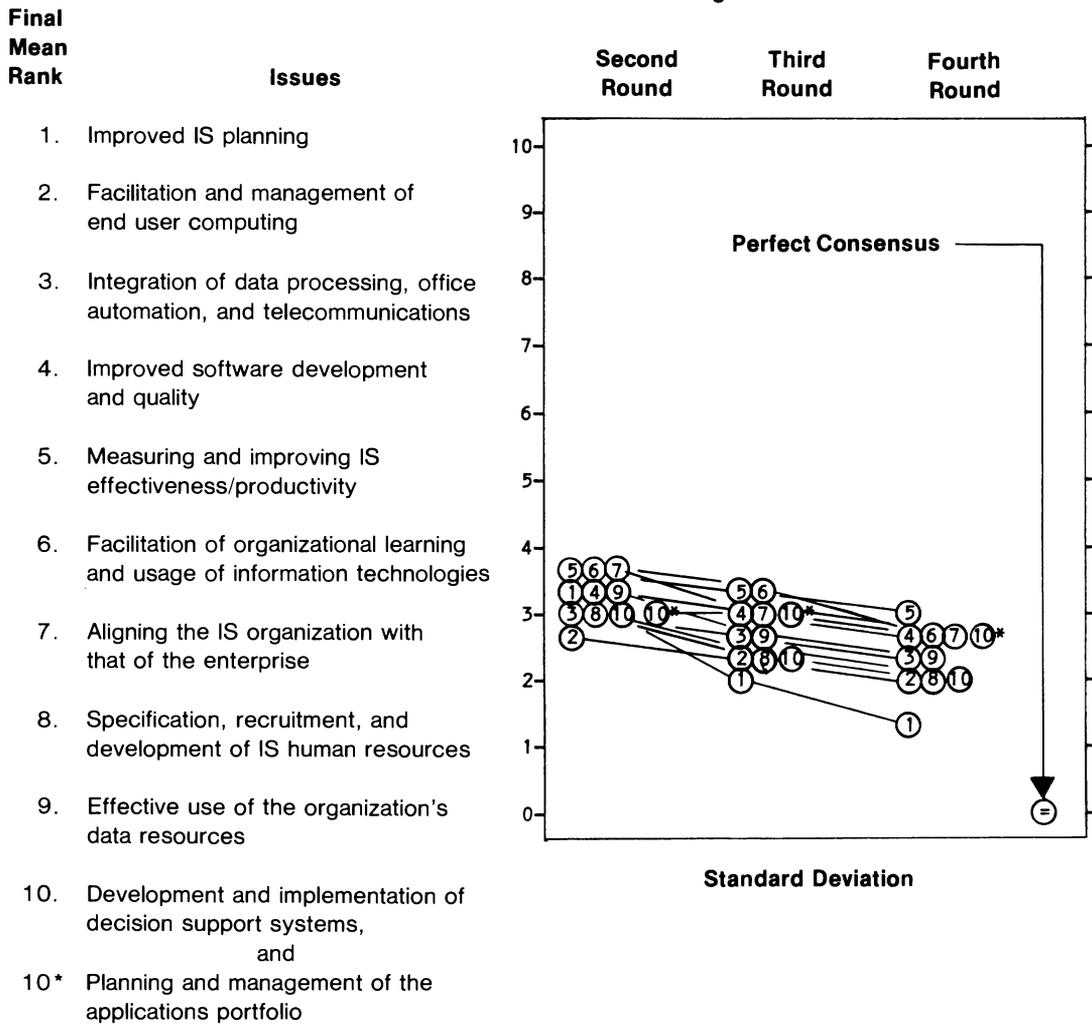
difference between group rank scores is zero (0.00) and the standard deviation is 0.32.

The third round brought with it a substantial reduction in the number of participants. The 62 who remained ranked the issues almost exactly as the N = 54 group did. Their top ten issues were the same. This would be expected since the 54 participants in the final round made up the great majority of the third round sample. The mean paired difference between group rank scores is 0.005 with a standard deviation of 0.143. The authors do not believe that these small differences adversely affect the results of the study.

### Concluding Remarks

The determination of a group of key management issues by an influential segment of the information systems community is an important contribution. It fills a need for individuals and organizations making decision about research, curriculum, professional programs, and business activities. The Delphi approach used to determine the issue ranking provides some degree of confidence that an actual consensus of views was captured. This new use of the Delphi technique can also be considered a contribution. Its success here may point to other possible uses in information systems research.

**Figure 3. List of Key IS Management Issues  
Rank Variance: Movement Toward Ranking Consensus**



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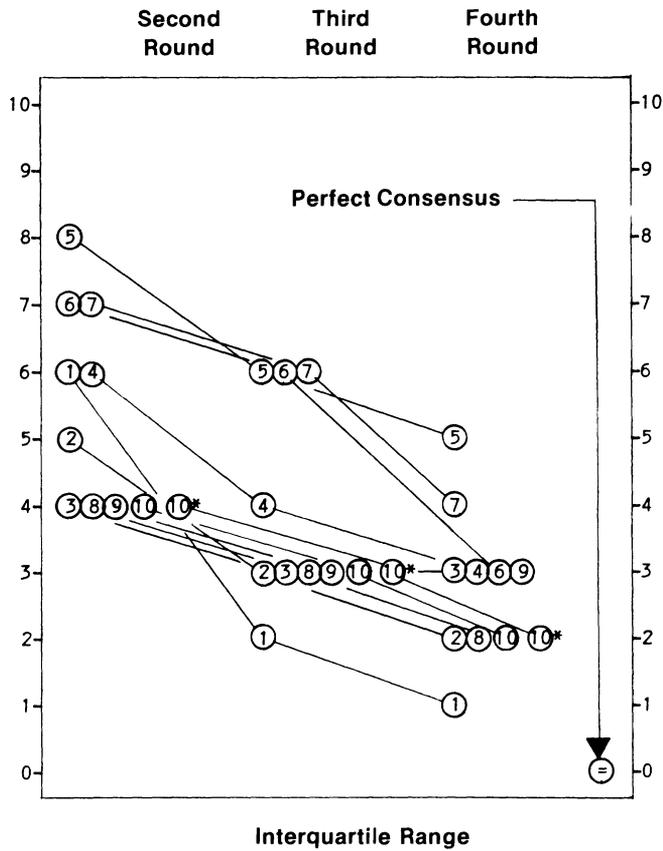
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### Appendix A1. Sample Questionnaire Key IS Management Issues

Please review your previous rankings and the group's rankings for both previous rounds of the survey. For each issue also review the group rationales for increasing and/or decreasing its ranking. Make a final ranking decision and record it in the blank. Remember that 10 is the highest and that you are to rank only the top ten issues. The remaining issues are to be designated with a '0'. Use only whole numbers for rankings.

YOUR 1ST RANK	GROUP 1ST RANK	YOUR 2ND RANK	GROUP 2ND RANK	YOUR FINAL RANK	ISSUES & RATIONALES
9	10	9	10	<u>9</u>	1. <u>ISSUE</u> : Improved IS planning.  <u>RATIONALE</u> : It is increasingly critical to an organization's success that it can integrate strategic and MIS planning and take advantage of changing information system technologies.
8	9	8	9	<u>8</u>	2. <u>ISSUE</u> : Facilitation & management of "end user" computing.  <u>RATIONALE</u> : The proliferation of "end user" computing through microcomputers and information centers offers the promise of improved productivity but also the dangers of poor management control of a powerful resource.
5	8	3	8	<u>2</u>	3. <u>ISSUE</u> : Integration of data processing, office automation, and telecommunications.  <u>RATIONALE</u> : The capability now exists to integrate systems that are based on these diverse technologies. Planning and management problems remain.
2	7	4	7	<u>5</u>	4. <u>ISSUE</u> : Improved software development and quality.  <u>RATIONALE</u> : The application development backlog remains at unacceptably high levels and users are getting impatient. Add to this the increasing costs of system development personnel and the need for improved system development is clear.
0	6	2	6	<u>1</u>	5. <u>ISSUE</u> : Measuring and improving IS effectiveness/productivity.  <u>RATIONALE</u> : 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.
10	5	10	5	<u>10</u>	6. <u>ISSUE</u> : Facilitation of organizational learning and usage of information system technologies.  <u>RATIONALE</u> : The organizations that will prosper are those that can integrate the new information system technologies into their operations and organization, e.g., engineering, manufacturing, products and services, etc.

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YOUR 1ST RANK	GROUP 1ST RANK	YOUR 2ND RANK	GROUP 2ND RANK	YOUR FINAL RANK	ISSUES & RATIONALES
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3	4	1	4	<u>3</u>	7. <u>ISSUE</u> : Aligning the IS organization with that of the enterprise.  <u>RATIONALE</u> : The effectiveness with which the IS organization can support the enterprise's information needs is affected by its organizational structure.
0	3	0	3	---	8. <u>ISSUE</u> : Specification, recruitment, and development of IS human resources.  <u>RATIONALE</u> : Current and future shortages of qualified IS personnel threaten the IS department's ability to keep up with the information needs of its parent organization.
0	2	0	2	---	9. <u>ISSUE</u> : Effective use of the organization's data resources.  <u>RATIONALE</u> : Organizational data is a resource that has not been effectively utilized.
0	1	0	1	---	10. <u>ISSUE</u> : Development and implementation of decision support systems.  <u>RATIONALE</u> : Improving the effectiveness of managers is an important objective for information systems. There has been much promise but too little success.
0	0	0	0	---	11. <u>ISSUE</u> : Planning and management of the applications portfolio.  <u>RATIONALE</u> : The difficulty in trading off the maintenance costs of old application systems with the development expenses of new ones makes this an important issue.
4	0	5	0	<u>6</u>	12. <u>ISSUE</u> : Planning, implementation, and management of office automation.  <u>RATIONALE</u> : Office automation is being implemented by many organizations to improve "white collar" productivity. How should this be done and what is the role of the IS department?
6	0	7	0	<u>7</u>	13. <u>ISSUE</u> : Planning and implementing a telecommunications system.  <u>RATIONALE</u> : Major changes in the technologies and the industry make this task a formidable one.

YOUR 1ST RANK	YOUR 1ST RANK	YOUR 2ND RANK	YOUR 2ND RANK	YOUR FINAL RANK	ISSUES & RATIONALES
1	0	0	0	___	14. <u>ISSUE</u> : Increased understanding of the role/contribution of IS.  <u>RATIONALE</u> : IS is often viewed as overhead expense with no appreciation of its proper role and its contributions to the organization.
0	0	0	0	___	15. <u>ISSUE</u> : Information security and control.  <u>RATIONALE</u> : As organizations become increasingly dependent on IS, there is greater risk from disclosure, destruction and alteration of data, and disruption of information services.
0	0	0	0	___	16. <u>ISSUE</u> : Determination of appropriate IS funding.  <u>RATIONALE</u> : There is no generally accepted way to establish the level of IS funding relative to the other funding needs of the organization.
7	0	6	0	<u>4</u>	17. <u>ISSUE</u> : Effective usage of graphics.  <u>RATIONALE</u> : Graphics offers an effective way to present information. Problems need to be resolved in using them interactively and remotely.
0	0	0	0	___	18. <u>ISSUE</u> : Impact of artificial intelligence.  <u>RATIONALE</u> : There is much controversy over whether AI will prove to be an academic exercise or a major force transforming IS and its parent organization.
0	0	0	0	___	19. <u>ISSUE</u> : Management of data and document storage.  <u>RATIONALE</u> : There is a need to provide for the massive document and data storage requirements that will be needed in the near future.

**Appendix A2. List of Key IS Management Issues  
Percentage Ranking Results**

Final Mean Rank	Issues	First Round		Second Round	
		N = 52 Rank	% who Mention	N = 54 Rank	% in Top Ten
1.	Improved IS planning	1	58.5	2	94.4
2.	Facilitation and management of end user computing	2	56.6	1	96.2
3.	Integration of data processing, office automation, and telecommunications	8	26.4	3	90.7
4.	Improved software development and quality	6	35.8	4	77.7
5.	Measuring and improving IS effectiveness/productivity	4	37.7	5	74.0
6.	Facilitation of organizational learning and usage of information technologies	3	43.4	6	62.9
7.	Aligning the IS organization with that of the enterprise	7	30.2	7	59.2
8.	Specification, recruitment, and development of IS human resources	4*	37.7	8	53.7
9.	Effective use of the organization's data resources	16	7.5	11	50.0
10.	Development and implementation of decision support systems	12	20.8	8*	53.7
11.	Planning and management of the applications portfolio	14	13.2	12	44.4
12.	Planning, implementation, and management of office automation	10	22.6	8*	53.7
13.	Planning and implementing a telecommunications system	9	24.5	15	33.3
14.	Information security and control	10*	22.6	12*	44.4
15.	Increased understanding of the role/contribution of IS	12*	20.8	14	37.0
16.	Determination of appropriate IS funding	14*	13.2	16	24.0
17.	Effective usage of graphics	18	3.8	19	11.1
18.	Impact of artificial intelligence	17	5.7	18	12.9
19.	Management of data and document storage	18*	3.8	17	18.5

\* indicates a tie

Third Round		Fourth Round	
N = 54	% in	N = 54	% in
Rank	Top Ten	Rank	Top Ten
1	100.0	1	100.0
2	98.1	1*	100.0
2*	98.1	3	98.1
4	87.0	4	92.5
5	83.3	5	88.8
6	75.9	5*	88.8
7	72.2	7	81.4
8	66.6	8	75.9
9	64.8	9	70.3
10	61.1	10	64.8
12	35.1	11	33.3
11	37.0	12	27.7
15	22.2	14	20.3
12*	35.1	13	22.2
14	25.9	15	18.5
16	12.9	16	7.4
17	9.2	17	5.5
19	7.4	18	1.8
17*	9.2	18*	1.8

**Appendix A3. List of Key IS Management Issues  
Mean Ranking Results**

Final Mean Rank	Issues	Second Round		Mean	S.D.
		N = 102 Rank	N = 54 Rank		
1.	Improved IS planning	1	1	6.8	3.4
2.	Facilitation and management of end user computing	2	2	6.1	2.8
3.	Integration of data processing, office automation, and telecommunications	3	3	5.0	2.9
4.	Improved software development and quality	4	4	4.7	3.4
5.	Measuring and improving IS effectiveness/productivity	5	4*	4.7	3.8
6.	Facilitation of organizational learning and usage of information system technologies	6	6	3.4	3.7
7.	Aligning the IS organization with that of the enterprise	7	7	3.3	3.6
8.	Specification, recruitment, and development of IS human resources	8	9	2.4	3.1
9.	Effective use of the organization's data resources	9	11	2.3	3.2
10.	Development and implementation of decision support systems	10	8	2.5	3.0
11.	Planning and management of the applications portfolio	11	12	2.1	3.0
12.	Planning, implementation, and management of office automation	12	9*	2.4	2.8
13.	Planning and implementing a telecommunications system	14	15	1.6	2.8
14.	Information security and control	13	13	1.9	2.8
15.	Increased understanding of the role/contribution of IS	15	14	1.7	2.9
16.	Determination of appropriate IS funding	16	16	1.3	2.8
17.	Effective usage of graphics	17	18	.6	2.0
18.	Impact of artificial intelligence	19	19	.5	1.8
19.	Management of data and document storage	18	16	.7	2.0

\* indicates a tie

Third Round				Fourth Round		
N = 62	N = 54			N = 54		
Rank	Rank	Mean	S.D.	Rank	Mean	S.D.
1	1	8.6	1.9	1	9.1	1.5
2	2	7.1	2.2	2	7.4	2.1
3	3	6.1	2.6	3	6.4	2.4
4	4	5.5	3.0	4	6.0	2.6
5	5	5.0	3.3	5	5.3	3.0
6	6	4.0	3.2	6	4.7	2.6
7	7	3.5	3.1	7	3.7	2.8
8	8	2.1	2.4	8	2.3	2.0
8*	8*	2.1	2.5	9	2.2	2.3
10	10	1.8	2.4	10	1.5	2.1
11	11	1.7	2.9	10*	1.5	2.6
12	13	1.5	2.3	12	1.3	2.4
13	12	1.1	2.5	13	.9	2.2
15	13*	1.3	2.3	14	.7	1.8
14	15	1.0	2.1	14*	.7	1.8
16	16	.6	1.8	16	.3	1.3
17	17	.4	1.7	17	.2	1.2
18	19	.3	1.2	18	.0	.5
19	18	.2	1.3	18*	.0	.1

**Appendix A4. List of Key IS Management Issues  
Median Ranking Results**

Final Mean Rank	Issues	N = 54 Rank	Second Round Range				
			LO	1Q	MED	3Q	HI
	1. Improved IS planning	1	0	4	8	10	10
	2. Facilitation and management of end user computing	2	0	4	6	9	10
	3. Integration of data processing, office automation, and telecommunications	3	0	3	5	7	10
	4. Improved software development and quality	3*	0	2	5	8	10
	5. Measuring and improving IS effectiveness/productivity	3*	0	0	5	8	10
	6. Facilitation of organizational learning and usage of information technologies	8	0	0	1	7	10
	7. Aligning the IS organization with that of the enterprise	6	0	0	2	7	10
	8. Specification, recruitment, and development of IS human resources	8*	0	0	1	4	10
	9. Effective use of the organization's data resources	10	0	0	5	4	10
	10. Development and implementation of decision support systems	11	0	0	0	4	10
	11. Planning and management of the applications portfolio	11*	0	0	0	4	9
	12. Planning, implementation, and management of office automation	6*	0	0	2	5	10
	13. Planning and implementing a telecommunications system	11*	0	0	0	3	9
	14. Information security and control	11*	0	0	0	4	10
	15. Increased understanding of the role/contribution of IS	11*	0	0	0	4	10
	16. Determination of appropriate IS funding	11*	0	0	0	0	10
	17. Effective usage of graphics	11*	0	0	0	0	8
	18. Impact of artificial intelligence	11*	0	0	0	0	8
	19. Management of data and document storage	11*	0	0	0	0	10

\*indicates a tie

**Third Round**  
N = 54    **Range**

Rank	LO	1Q	MED	3Q	HI
1	2	8	9.5	10	10
2	0	6	8	9	10
3	0	5	6	8	10
3*	0	4	6	8	10
3*	0	2	6	8	10
6	0	1	4	7	10
6*	0	0	4	6	10
8	0	0	2	3	10
10	0	0	2	3	10
9	0	0	1	3	10
11	0	0	0	3	10
11*	0	0	0	3	8
11*	0	0	0	0	9
11*	0	0	0	2	9
11*	0	0	0	1	10
11*	0	0	0	0	9
11*	0	0	0	0	8
11*	0	0	0	0	6
11*	0	0	0	0	9

**Fourth Round**  
N = 54    **Range**

Rank	LO	1Q	MED	3Q	Hi
1	2	9	10	10	10
2	1	7	8	9	10
3	0	5	7	8	10
3*	0	5	7	8	10
5*	0	3	6	8	10
6	0	3	5	6	10
7	0	1	4	5	10
8	0	1	2	3	9
8*	0	0	2	3	9
10	0	0	1	2	10
11	0	0	0	2	10
11*	0	0	0	3	10
11*	0	0	0	0	8
11*	0	0	0	0	9
11*	0	0	0	0	7
11*	0	0	0	0	6
11*	0	0	0	0	8
11*	0	0	0	0	4
11*	0	0	0	0	1

**Appendix A5. List of Key IS Management Issues  
N = 54 Group and Whole Group Comparison**

Group Rank	Issues	Second Round					
		N = 54			N = 102		
		Rank	Mean	S.D.	Rank	Mean	S.D.
1.	Improved IS planning	1	6.8	3.4	1	6.5	3.7
2.	Facilitation and management of end user computing	2	6.1	2.8	2	5.4	3.1
3.	Integration of data processing, office automation, and telecommunications	3	5.0	2.9	3	4.7	3.1
4.	Improved software development and quality	4	4.7	3.4	4	4.3	3.6
5.	Measuring and improving IS effectiveness/productivity	4*	4.7	3.8	5	4.1	3.6
6.	Facilitation of organizational learning and usage of information system technologies	6	3.4	3.7	6	3.7	3.6
7.	Aligning the IS organization with that of the enterprise	7	3.3	3.6	7	3.5	3.8
8.	Specification, recruitment, and development of IS human resources	9	2.4	3.1	8	2.7	3.2
9.	Effective use of the organization's data resources	11	2.3	3.2	9	2.6	3.3
10.	Development and implementation of decision support systems	8	2.5	3.0	10	2.5	3.0
11.	Planning and management of the applications portfolio	12	2.1	3.0	10*	2.5	3.1
12.	Planning, implementation, and management of office automation	9*	2.4	2.8	12	2.4	3.0
13.	Planning and implementing a telecommunications system	15	1.6	2.8	14	1.7	2.7
14.	Information security and control	13	1.9	2.8	13	2.0	2.8
15.	Increased understanding of the role/contribution of IS	14	1.7	2.9	15	1.6	2.9
16.	Determination of appropriate IS funding	16	1.3	2.8	16	1.5	2.9
17.	Effective usage of graphics	18	.6	2.0	17	.9	2.4
18.	Impact of artificial intelligence	19	.5	1.8	19	.6	1.8
19.	Management of data and document storage	17	.7	2.0	18	.8	2.2

\*indicates a tie

Third Round					
N = 54			N = 62		
Rank	Mean	S.D.	Rank	Mean	S.D.
1	8.6	1.9	1	8.4	2.3
2	7.1	2.2	2	6.9	2.4
3	6.1	2.6	3	6.1	2.8
4	5.5	3.0	4	5.4	3.0
5	5.0	3.3	5	5.0	3.3
6	4.0	3.2	6	3.9	3.1
7	3.5	3.1	7	3.5	3.1
8	2.1	2.4	8	2.4	2.7
8*	2.1	2.5	9	2.3	2.7
10	1.8	2.4	10	1.9	2.6
11	1.7	2.9	11	1.7	2.8
12	1.5	2.3	12	1.4	2.2
14	1.1	2.5	13	1.2	2.5
13	1.3	2.3	14	1.1	2.2
15	1.0	2.1	15	1.0	2.2
16	.6	1.8	16	.7	1.9
17	.4	1.7	17	.4	1.6
18	.3	1.2	17*	.4	1.4
19	.2	1.3	19	.2	1.2