AN ANALYSIS OF KEY MIS ISSUES
by
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We accept this thesis as conforming
to the required standard

THE UNIVERSITY OF BRITISH COLUMBIA
25 April 1988

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ABSTRACT

The purpose of this research was to examine the topical Management Information System (MIS) issues of the day to determine which are most important along with the factors contributing to their importance.

Two professional societies from the greater Vancouver area were surveyed to obtain the MIS practitioners' opinions as to the most important issues. The respondents predominantly held managerial positions while the organizations comprised a wide cross section of sizes and industries.

Data management, planning and integrating technologies were the top rated issues as seen by the aggregation of respondents. A factor analysis identified five higher level issues. An analysis was also performed to determine if importance was related to the demographic variables of company size, industry, respondent position and innovator category. Comparisons were made with previous research with the main trend being the increased importance placed on technical or application system issues versus management issues.
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I would like to dedicate this thesis to my parents, John and Lina Graham, who taught me the value of education and who supported me throughout the years that I have attended university.

In addition, I would like to offer special thanks to Professor Albert S. Dexter, my thesis advisor, for his ideas and encouragement. They were especially appreciated during the many difficult periods encountered while conducting this study.
CHAPTER 1. INTRODUCTION AND OVERVIEW OF RESEARCH

1.1. BACKGROUND AND MOTIVATION

As computer technology plays an increasingly important role in organizations, it also brings numerous MIS issues which can be viewed as threats, problems, or opportunities associated with achieving goals or objectives. In the IS context, the general issue is how to utilize computer technology to maximum effectiveness within an organization. The purpose of this research is to identify, examine and determine the relative importance of the key MIS issues. With this perspective, the issues can be better addressed by practitioners and academics in the MIS profession. The general research question is: Which issues are most important to MIS professionals and what are the factors contributing to their importance?

There are several perspectives and viewpoints as to why it is important to understand the relative importance of MIS issues. By knowing their significance, it is possible to direct research into the most critical areas. Academic institutions, professional societies and MIS journals should ensure that the full range of MIS issues are adequately treated in courses, conferences and publications. Consultants may be assisted in solving their clients' problems by improving their understanding of the relative importance of MIS issues across other organizations. Systems professionals within organizations should know how MIS issues specifically affect them so that they may prioritize and allocate resources accordingly.
In order to answer the general research question, this study obtained opinions from a wide cross section of people in the MIS field (but with an emphasis on managers). Both survey and interview techniques were utilized in soliciting information from the MIS professionals. Their opinions were compiled so that managers may benefit from knowing the predominant issues and underlying reasons from other organizations. For instance, there may be opportunities in MIS which the manager hadn't considered before learning the opinions and plans of his peers. Sprague and McNurlin (1986) underscore this point by arguing that since technology is changing so rapidly, it is essential for managers to understand the experiences of others. The main output of this research, then, is a prioritized list of MIS issues, along with their underlying factors, as perceived by a wide cross section of MIS practitioners.

Because information was collected from leading MIS practitioners, the research results are intended to be useful and practical. However, it should also assist academics as they make judgements in selecting the most relevant areas for their work. This research, then, may serve as a communication vehicle between practitioners and academics.

A byproduct of this research is expected to be the questionnaire developed to conduct the survey. An organization may use this instrument to identify its own priorities. It should also serve as a communication vehicle within an organization by serving as a starting point in identifying varying priorities; say between IS management and non IS management. An organization can also compare its results with the aggregated priorities of other organizations so that it can
INTRODUCTION AND OVERVIEW OF RESEARCH / 3

determine if some issues have been overlooked.

The paper proceeds as follows. The remainder of the introduction chapter will specify the research objectives along with two models used as a framework to assist with achieving the objectives. The broad research strategy is then described. The second chapter reviews previous research by examining both MIS Issues studies and frameworks related to the strategic issues. Specific research questions and hypothesis are presented in chapter three. Next the methodology used for this research is described followed by the analysis and findings pertaining to the research questions. The final chapter draws the major conclusions from the study and recommends some future directions for research of this type.

1.2. RESEARCH OBJECTIVES

Although several studies of this type have been conducted, it is felt that numerous useful extensions may be added. This study builds upon previous research so that useful comparisons such as trends may be made for the profession. From an academic viewpoint, this research seeks to improve the methodology for future studies. The specific objectives of this study are:

1. Obtain an insight into MIS issues in the Canadian environment since previous studies have been performed in the United States.

2. Improve the methodology used in obtaining MIS issues. In particular, use the multi-method concept which obtains a set of results for each of several methods used. The value of multi-method is that a construct is measured more than once
which adds validity to the results. It also facilitated comparisons with previous research.

3. Determine how certain demographic variables such as company size and respondent position affect the perceived importance of MIS issues.

4. Obtain an improved historical perspective of MIS issues. Since it has been two years since the last study, these results will add that timeframe so that we may get a better perspective on historical trends within MIS.

1.3. RESEARCH FRAMEWORK

1.3.1. MIS Issues Framework

Research to date in the United States suggests that the ranking of an MIS issue does not measure the absolute importance of any given issue. What is important to one individual or company may not be important to others. Hartog and Herbert (1986 B) feel that "importance varies according to industry categories, size of companies and many other variables".¹ This research, then, will look for relationships between the MIS issues and the four respondent and organizational characteristics illustrated in Figure 1.

Figure 1 should be interpreted as follows. The centre box represents 29 important MIS issues, drawn from previous research and the literature, which are investigated in this study. The boxes on the left represent factors that are expected to affect a given organization’s prioritization of the issues. For example,

¹ Reference 7 - pg. 79
telecommunications issues would likely be more important in large (hence, geographically dispersed) firms; factory automation issues are likely more important in manufacturing organizations.

The two boxes on the right of Figure 1 depict alternative consolidations of the issues. One such consolidation is the six major categories set out by Sprague and McNurlin (1986). The 29 specific issues may then be allocated to these
more global issues. This allocation was made based on this researcher's judgement as to which specific issue fit best with the global issue; hence this is an exploratory attempt at determining a higher level grouping of issues.

Alternatively, following Branchau and Wetherbe (1987), the MIS issues may be categorized as either management/enterprise oriented (ME) or technology/application oriented (TA). Management issues are derived from the generic management functions of planning, organization, implementing, and control. They can be viewed as requiring involvement of individuals outside of IS. Technology/application issues are more specific to computer hardware and software, and tend to be internal to the IS function. On the questionnaire there are 17 ME issues and 12 TA issues. This allocation used Branchau's groupings for 22 of the 29 issues. The remaining seven issues, not included in the Branchau study, were allocated using this researcher's judgement.

Sprague and McNurlin's global issues along with the specific issues allocated to each category and their ME/TA indicator are:

1. The strategic importance of IS
   - Organizational Location of MIS (ME)
   - Planning (ME)
   - Competitive Advantage (ME)
   - Educating Senior Personnel (ME)

2. The management of technologies
   - Integration of Technologies (TA)
   - Telecommunications Technology (TA)
   - 4th Generation Languages (TA)
   - Expert Systems & Artificial Intelligence (TA)
   - Factory Automation (TA)

3. The management of data and information
   - Data Security (TA)
   - Data Management (ME)
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- External Data (ME)
- Information Architecture (ME)
- Relational Databases (TA)

4. Managing End User Computing
- End User Computing (ME)
- Decision Support Systems (TA)
- Information Centres (ME)
- Office Automation (ME)

5. Managing System Development
- Quality Assurance (TA)
- Software Development (TA)
- Measuring Productivity (ME)
- Packaged Software (TA)
- Systems Payoff (ME)
- Applications Portfolio (TA)

6. Managing the Human Factors in MIS
- Recruiting and Training (ME)
- Centralization/Decentralization of Services (ME)
- Productivity (ME)
- Organizational Impact (ME)
- Organizational Learning (ME)

In order to confirm the general categorizations above, a factor analysis has been performed on the data to determine whether the specific issues included under each domain suggested by Sprague and McNurlin (1986) and Branchue and Wetherbe (1987) in fact group together.

1.3.2. Methodology Framework

Previous research has employed several measuring and statistical techniques in determining the importance of MIS issues. This causes difficulties in explaining why the variations occur.

This research will use four information elicitation techniques so that we may see
how each affects the results. One choice of technique concerns whether to give a subject a prompt or to simply ask which issues are most important without any aids. If prompts are given, there is a choice between ranking issues against one another or rating each issue independently. In presenting the issues, there is a choice between a descriptive approach and a normative or action statement. This study will examine the relationship between these choices as portrayed in Figure 2.

Figure 2 should be interpreted as follows. Each of the four boxes represents a distinct information elicitation technique for determining the MIS issues. The box on the left is the unaided method and corresponds to Section 2 of the questionnaire (Appendix 2). The other three boxes correspond to the aided methods as presented in Sections 3 - 5 of the questionnaire. This research determines the degree of concordance between each pair of the four techniques; hence there are six relationships.

1.4. RESEARCH STRATEGY

A ten page questionnaire was developed (Appendix 2) using several instruments from previous U.S. work along with two additional issues identified in the literature. These questions were pilot tested with a group of 20 data processing professionals from the Focus Users Group in Vancouver. A second pilot was run using the MIS community (6 MIS professors, 15 MIS graduate students) at UBC. These two pilots served to improve the clarity of the instructions and the presentation of the issues. The 29 issues to be included in this research
purposely covers all issues found to be in the top 19 from the four predominant studies done in the U.S. This facilitated comparisons among the studies.

To obtain the opinions of leading IS professionals, the Vancouver chapters of two
large Canadian professional societies, CIPS and DPMA, were surveyed. It is felt that these two groups are the largest, most popular in Vancouver and that their membership represents a diverse cross section of industries and positions within MIS but with an emphasis on management positions. For instance, 60 per cent of CIPS and DPMA members are in a supervisory or managerial position.

Personalized letters (Appendix 1) and the questionnaire were mailed to 632 members representing the entire Vancouver memberships of DPMA and CIPS but excluding academics and students. These latter groups were omitted because the survey questions specified importance to the individual based on their organization's situation. As well, this study is interested in the commercial environment, not academic. The members surveyed represented a wide range of company sizes, industries, and job positions. Section 1 of the survey asked for the basic demographic data. Section 2 was an unaided query asking respondents to list and briefly describe their three most important MIS issues. Section 3 asked respondents to rate each of 29 issues independently on a 7-point numerical scale, indicating their opinions as to degree of importance concerning each issue with room provided for written comments to explain any aspect of the rating. Section 4 listed the issues by title only and asked the subjects to rank from 1 to 10 their top ten issues. Section 5 was similar to Section 3 in that it asked for independent ratings on a 7-point Likert type scale for the 29 issues. There were two main differences between Sections 3 and 5. The first was in the wording of the description. Section 3 simply defined the MIS issues, while Section 5 provided a normative comment and eliminated the issue title. The second difference concerned the action planned to address the issue. Section 3 based
importance based on planned resources allocated over the next 2 - 3 years. Section 5 simply asked for level of agreement for the issues as they pertained to their organization.

Respondents were also asked to attach a business card if they were willing to be included in a short follow up interview. Interviews were conducted with these individuals (selecting only senior managers) to determine some of the major factors behind the issues. Some questions posed were:

1. What are the main reasons why this issue is an opportunity, threat or problem within your organization?
2. Why did you rate a particular issue as high or as low as you did? What was the thinking behind your rating?
3. What makes a particular issue more important to you than the others?
4. What is your company planning to do in addressing this issue?
5. Can you explain why you rated a particular issue much higher/lower than others have rated it?
6. Your most important issues tend to be ME (TA). Can you explain your emphasis on this group?
CHAPTER 2. LITERATURE REVIEW

2.1. PREVIOUS SURVEYS ANALYZING MIS ISSUES

2.1.1. Introduction

Several studies of key MIS issues have been published over the past eight years. Most of the studies thus far have been performed by academics in the United States, but recently consulting firms have begun to address the area. A review of relevant research follows along with their main findings. This review also includes an identification of areas which are extended in this research.

2.1.2. Ball & Harris (1982)

The Society for MIS was surveyed in 1980 using a questionnaire approach. The population consisted of mainly middle to upper management although no results were reported contrasting the opinions of the various classes of respondents. This has therefore been included in the present study. The survey meant to capture demographic data about the SMIS membership and to determine what the members believed to be important and how the Society should respond to that need. Subjects (417 responses of 1400 surveyed) rated 18 MIS issues using a 6 point numerical scale on their importance to the individual and the role that SMIS should play. The only statistics generated were mean scores and standard deviations, which roughly measured degree of agreement on each issue. Although no other claims were made regarding statistical validity, this study was
significant in that it was the first survey of its type and is now taken as the starting point for comparing the evolution of MIS issues over a number of years.

2.1.3. Martin (1982)

This study used John Rockart's Critical Success Factor (CSF) approach on fifteen top executives of large organizations (who also acted as an advisory group to Indiana University). According to Rockart (1979), CSF's are "the few key areas where things must go right for the business to flourish." This study used a combination of interviews and successive rounds (similar to the Delphi technique) in an attempt to gain a consensus of the CSF's which in this case concerned the management of an MIS organization. The main contribution of Martin's study was to identify the CSF's across several organizations. Six factors were articulated as essential by at least 11 of the 15 MIS executives:

1. Systems Development
2. DP Operations
3. Human Resources Development
4. Management Control of the MIS/DP organization.
5. Relationships with the management of the parent organization.
6. Support of the objectives and priorities of the parent organization.

Rockart points out that CSF's centre on information needs for control over existing business versus information for strategic planning which explains why planning received little attention in this study. As well, the small sample size

1 Reference 11 - pg. 85
(n=15), weakens any generalizations which can be made. The results, although exploratory, have been useful in that they laid a framework of broad CSF's which could be used in running an MIS function. They are also helpful as a communication device with senior management.

2.1.4. Dickson et al. (1984)

This study, conducted in 1983, surveyed 54 senior MIS practitioners at the director, vice-president and consultant level as well as four academics. The purpose of the research was to answer the following questions:
1. What are the top 10 issues, in order of importance, facing IS management?
2. How much agreement is there on the importance?

Subjects were asked to rate the top 10 from a list of 19 issues. In looking for a consensus, the Delpi technique was employed. Four rounds were administered before a final consensus was determined. The authors presented their data in terms of means, standard deviations, interquartile ranges of rank scores, and the percentage of respondents who ranked issues in the top ten. No statistical tests were performed to determine whether an issue was ranked differently from the others. While the authors were careful to caution readers as to generalizing from their data, the study was particularly helpful in providing a useful framework for further research. Their use of the Delpi technique was well suited to the task of identifying and gaining consensus on key MIS issues. They as well compared their results to both Ball and Harris (1982) and Martin (1982) studies.
2.1.5. Arthur Andersen & Co. (1986)

This consulting company surveyed 120 senior MIS executives from the Fortune 500 list. They used an unaided survey asking respondents to simply list their concerns, followed by an aided survey in which subjects rated 22 issues on how important a concern it was using a 5 point numerical scale. The only result presented was a ranking which compiled the percentage of all respondents rating a concern as either somewhat or very important. No statistical results were reported from this survey.


This was an update of the Dickson et al. (1984) study using the same population (SMIS) and techniques. In addition to reevaluating the MIS issues identified in the previous study to see how they changed over time, this research sought the opinions of general managers outside of IS, but to whom the IS managers reported, as well as IS managers. Their results were somewhat different than those obtained in 1984 with three new issues appearing in the top ten. Two of these issues, competitive advantage and information architecture, had not been included in the earlier work at all. This demonstrates how quickly priorities can change in just a few years which is part of the motivation for this research. The 14 general managers and 68 IS managers reached consensus on the top 10 issues although there were slight differences in their order of importance. Their data from the third Delphi round was subjected to statistical analysis using Kendall's Coefficient of Concordance (p < .001) demonstrating a
statistically significant degree of agreement with the rankings.

This study also classified MIS issues as to whether they were related to management/enterprise (ME) problems or related to technology/application (TA) problems. These authors noted that ME issues were increasing in importance while TA issues were decreasing. As in 1984, no comparison was made based on the respondent's position within the overall classification since most of the respondents were senior managers, nor were comparisons made either by company size or industry.

2.1.7. Hartog & Herbert (1986 A)

To answer the question of which issues facing MIS management are most important over the next 2-3 years, this study surveyed 107 St. Louis based companies (63 returned). Using Dickson's (1984) work as a starting point, the issues were refined using in depth interviews with twelve members of a St. Louis MIS managers group. The issues were rated on a 4 point numerical scale from not important to very important. The results of this study are quite different from Branchreau (1986), even though the surveys were conducted at about the same time. One notable methodological difference was that Hartog and Herbert used 4 point numerical scales whereas Branchreau and Wetherbe employed a direct ranking technique. While the timeframe of the Hartog and Herbert study coincided with Branchreau and Wetherbe, differences in wording of the questions and instructions along with differences in the sample of respondents make comparisons difficult. This has motivated many of the methodology questions to
be answered in this research.

In addition to the mean ranks, interviews were conducted to obtain insights into the ratings. Even though all levels of management were surveyed, no attempt was made to compare their responses. No statistical tests were made to see if an issue differed significantly in its importance from other issues.

2.1.8. Hartog & Herbert (1986 B)

This study built on the work done in the St. Louis area by the same researchers. This time the population surveyed was the Fortune 1000 companies with 40 per cent returned. The questionnaire was revised somewhat with the addition of two new issues. Otherwise the same questions were asked using the same 4 point numerical scale. Surprisingly, the results were quite different than those found previously leading to the unlikely speculation that the issues for St. Louis are different from the United States as a whole. Although this study noted that responses varied by respondent position, company size, etc., no analysis was conducted using these variables. This provides another extension for this research.

2.1.9. Conclusions

The above literature demonstrates that a series of studies is useful for MIS issues research because of temporal changes. However, comparability is a problem because of differing methodologies.
Probably the most compelling feature of such research, however, is the continuing interest of both MIS academics and practitioners in knowing the collective mindset of the professional MIS community. A summary of the results of previous research is consolidated and summarized in Table 1.

2.2. THE STRATEGIC IMPORTANCE OF SYSTEMS

2.2.1. Porter & Millar (1985)

In parallel with the MIS issues research, there recently has been considerable attention devoted to the strategic significance of information technology. Of the many papers written in recent years on the strategic significance of new information technology, the predominant author has probably been Michael Porter who has advanced the notion of gaining substantial competitive advantage through the use of systems. Porter & Millar (1985) have devised a framework for analyzing the strategic significance of information technology. First an organization needs to determine which of three basic strategies it uses to compete:

1. Become the low cost producer
2. Differentiate the product so that customers will pay more.
3. Develop a niche either through product or geography or a combination of the two.

Porter goes on to describe the concept of a value chain in which an organization's activities can be viewed as either primary (physical creation of products, logistics) or support (infrastructure for performing the primary activities). Since each activity has a physical and information processing activity, strategic
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Table 1. MIS ISSUES 1980 - 1986
uses of information technology can be identified by examining each primary activity against the support activities while applying one of the three basic competitive strategies described above. By using Porter's and other frameworks, more organizations are thinking in strategic terms for their IS function. This is evidenced by the high ratings given to strategic issues in previous MIS issues studies (see Table 1).

2.2.2. McFarlan, Mckenney and Pyburn (1983)

McFarlan et al. have developed a framework to help organizations assess the value of strategic information systems. They feel that firms should view the existing and future portfolio of systems and for each, rate them from low to high based on the degree to which the organization depends or will depend on the systems for conducting its business. Perhaps the firm specific data that McFarlan et al. articulated can be generalized to an industry level analysis. If so, this leads to the following four categories with each category suggesting a set of organizational responses.

1. Support - The strategic value of both the existing and proposed systems is low. "A large manufacturing company fits this category perfectly". While McFarlan et al. were talking about a particular firm that they had researched, the popular wisdom has begun to interpret the data as more general to manufacturers.

2. Factory - The strategic value of current systems is high but is low for proposed systems. Some airlines (with complex reservation systems) might fall

1 Reference 9 - pg. 152
into this category. However, the industry interpretation is very complicated. Some major airlines now run their reservation systems as a separate subsidiary.

3. Turnaround - The strategic value of existing systems is low but with upcoming systems, the potential strategic value is high. Companies in this class have the opportunity to benefit strategically but also face the threat of losing competitive advantage by not developing uses of information technology.

4. Strategic - These companies attach a high value to both existing and proposed systems. Industries which use information as a basic service or product, such as many banking and insurance companies, are in this group. In postulating an industry level hypothesis, we wish to make it clear that the nature of the industry may provide an insurance company or bank the opportunity to be strategic; just being a bank or insurance company does not make it strategic. McFarlan et al. commented that "some companies, like many banks and insurance companies, are both critically dependent on the smooth functioning of the IS activity for their daily operations and have applications under development that are vital to their competitive success." ¹ We add here that the authors were commenting on the insurance companies and banks that they had studied.

One objective of this research is to extend the previous research which may have been firm specific to an industry level. We have examined the various MIS issues as well as coupled them to strategic information technology considerations and to industry categories.

¹ Reference 9 - pg. 150
CHAPTER 3. RESEARCH QUESTIONS TO BE ANSWERED

3.1. INTRODUCTION

There are two general categories of research questions. First, we are interested in the actual relative importance of the MIS issues, evident trends, and the association between certain demographic phenomenon and the issues as depicted in Figure 1. This category, then, covers questions related to the issues themselves. The second category covers questions related to methodologies. Here we are interested in determining whether the information elicitation technique used affects the results as depicted in Figure 2. As evidenced by the critique of the previous research, there are several methodological questions for which we expect to have answers.

3.2. QUESTIONS RELATED TO MIS ISSUES

3.2.1. Importance to Vancouver MIS Professionals

All of the issues presented have been considered as important since they were derived from panels of experts in previous studies and from the literature. Therefore, the general research question to be answered is: What issues do leading IS professionals consider to be the most important to address in the next 2-3 years? How do IS professionals in the greater Vancouver area perceive the MIS issues? What is their relative order of importance? Previous research has shown variations, without explanation, due in part to the geographic area which has been examined (Hartog 1986 A, Hartog 1986 B). We are therefore looking
for a comprehensive snapshot of what issues are predominant for organizations in
greater Vancouver in 1987/88.

3.2.2. Trends with MIS Issues

How do the results differ from the findings of U.S. studies? What trends are
evident? Now that we have data from 1980-86 (Table 1), we can see some
longer term trends developing. Some trends, with possible explanations, which
have been noted by Brancheau and Wetherbe (1987) include the following:
- End user computing is decreasing in importance which "reflects the increased
  experience most IS executives now have with the issue". Information centres
  and other support services have resulted in an improved understanding of end
  user computing so that it is becoming a less important issue.
- Office automation and decision support systems, similarly to end user
  computing, are decreasing in importance due to greater experience.
- Measuring productivity is decreasing in importance as an issue, not because it
  has been resolved, but because measurement is difficult, managers are giving up
  trying as "few concrete measures exist for assessing the health of the IS
  organization".
- Integrating technologies is decreasing because real progress has been made or
  because newer issues, especially those related to strategic areas, have become
  predominant.
- Recruiting and training is decreasing due to improvements made in many
  organization's education system.

1 Reference 3 - pg. 29
2 Reference 3 - pg. 28
Software development is decreasing because managers are focusing their attention on MIS issues affecting the entire organization. Also, packaged software has lessened the importance of software development.

- Applications portfolio, for reasons similar to software development, are decreasing in importance.

- Overall, management/enterprise issues are increasing in importance while technology/application issues are decreasing. This reflects the growing emphasis that IS managers place on issues related to the entire organization.

Hartog and Herbert (1986 B) also made a number of observations for trends in MIS issues. Their two main conclusions were that the "end user computing revolution as seen by MIS managers is over and that a counter revolution aimed at winning the hearts and minds of top management has begun". Other trends noted were:

- Data security is decreasing in importance possibly because "managers may feel more control over some of the components" of this issue.

- The issues which are increasing have been raised by the alignment issue which seeks to improve the manner in which the MIS function supports the business. These issues include data management, educating senior personnel, telecommunications, and decision support systems.

In addition to comparing the results of this study to the earlier works to determine whether the above claims are supported, this research examined the historical data from 1980-88 in an attempt to extract some longer term trends.

1 Reference 7 - pg. 79
2 Reference 7 - pg. 81
3.2.3. Aggregation of MIS Issues

Does the response from the 29 specific issues map onto the 6 global issues and the ME versus TA issues as illustrated in Figure 1? That is, can we map the specific issues onto the more general issue categories with some statistical validity? Here we are taking an exploratory search for a reduced set of underlying factors which are responsible for the covariation among the observed 29 variables (issues).

3.2.4. Demographics and MIS Issues

Size - What is the relationship between company size and the importance of issues? McFarlan et al (1983) noted that as organizations increase in size and complexity, they need more formal planning processes. Therefore, can we expect larger organizations to rate issues such as planning higher than smaller organizations? Also, because larger organizations will normally have more systems operating at many locations, can we expect them to rate issues related to integration such as integrating technologies, telecommunications and data management as more important than smaller firms? The specific hypothesis (stated in null form) to be tested are:

- **HoS1**: Large Organizations rate planning the same as small organizations.
- **HoS2**: Large Organizations rate integration the same as small organizations.
- **HoS3**: Large Organizations rate telecommunications the same as small organizations.
- **HoS4**: Large Organizations rate data management the same as small organizations.
The alternative hypothesis for the above are:

- **HaS1**: Large Organizations rate planning higher than small organizations.
- **HaS2**: Large Organizations rate integration higher than small organizations.
- **HaS3**: Large Organizations rate telecommunications higher than small organizations.
- **HaS4**: Large Organizations rate data management higher than small organizations.

In addition to the specific hypothesis, all issues will be analyzed along the size dimension to determine where statistically significant differences occur.

**Industry** How does the level of importance vary according to industry? Sprague and McNurlin (1986) in reviewing McFarlan et al. (1983) stated "some organizations in some industries will find strategic opportunities rich and valuable. For instance, the strategic use of information systems in banking and financial services is not merely valuable, it is a matter of survival! Other industries and organizations may find lesser value in strategic systems." This suggests that companies in information intensive industries should be more concerned with the strategic importance of systems. Conversely, manufacturing companies may better fit the support category and can be expected to rate such non-strategic issues as software development the highest. This framework will be tested with the following hypothesis:

- **HoI1**: Finance organizations rate planning the same as Manufacturing firms.

Reference 12 - pg. 50
RESEARCH QUESTIONS TO BE ANSWERED / 27

HoI2: Finance organizations rate competitive advantage the same as Manufacturing firms.

HoI3: Manufacturing firms rate software development the same as Finance organizations.

The alternative hypothesis are:

HaI1: Finance organizations rate planning higher than Manufacturing firms.

HaI2: Finance organizations rate competitive advantage higher than manufacturing firms.

HaI3: Manufacturing rates software development higher than Finance organizations.

In addition to the hypotheses related to the strategic grid, it is anticipated that some issues will tend to be specific to certain industries. For instance, factory automation is predominantly a manufacturing concern. Expert systems have been making their way into the financial sector, notably with financial planning applications. The industry specific hypotheses are:

HoI4: Manufacturing firms rate factory automation the same as the average rating of all other industries.

HoI5: Financial services firms rate expert systems the same as the average of all other industries.

The alternative hypothesis are:

HaI4: Manufacturing rates factory automation higher than the average rating of all other industries combined.

HaI5: Finance rates expert systems higher than the average of all other industries.
An exploratory analysis has also been performed to determine which industries rate some MIS issues significantly different than other industries.

**Respondent Position** - How do MIS issues vary by respondent? Studies in the U.S have shown that senior IS managers rate strategic issues highest and are less concerned about technology/application issues. For instance, Brancheau and Wetherbe (1987), whose research was directed predominantly at senior managers, found that their top nine issues were all management in nature led by planning, competitive advantage and organizational learning (Table 1). On the other hand, senior managers rated more technical issues such as integration and software development lower. Intuitively, one would expect that a person's IS role affects their view of the issues; for example, system developers should have different priorities than senior managers since their responsibilities are different. Therefore, this research has obtained the perceptions of all important IS professional roles such as middle and operational managers, consultants, and system developers.

Specific hypothesis to be tested for respondent position are:

- **HoP1**: Top management rates planning the same as Operational Management.
- **HoP2**: Top management rates competitive advantage the same as Operational Management.
- **HoP3**: Top Management rates integrating technologies the same as the average of all other positions combined.
- **HoP4**: Top Management rates software development the same as the average of all other positions combined.

The alternative hypothesis are:

- **HaP1**: Top management rates planning higher than Operational
Management.

HaP2: Top management rates competitive advantage higher than Operational Management.

HaP3: Top Management rates integrating technologies higher than the average of all other positions combined.

HaP4: Top Management rates software development higher than the average of all other positions.

Again, an exploratory analysis has been conducted to determine if the importance of some MIS issues are significantly different for some positions than they are for other positions.

**Innovator Class** - Innovativeness is the degree to which an organization is relatively earlier in adopting something than other organizations. Rogers (1983) starts with the premise that not all organizations adopt innovations at the same time. Further, the rate at which innovations are adopted follows a bell shaped curve and approaches normality. Using the mean and standard deviation, Rogers goes on to define five categories of adoption class. The innovator class consists of those organizations who adopt greater than two standard deviations above the mean which is 2.5 per cent. This group is characterized by a desire for risk and the ability to understand and apply technical knowledge. The early innovator category adopt between one and two standard deviations above the mean and comprise 13.5 per cent of organizations. They are able to successfully and discretely use new ideas. The early majority adopt between average adoption time and one standard deviation above average and account for 34 per cent of organizations. This group deliberates for some time before adopting. The late majority is average to one standard deviation below the mean adoption time
comprising 34 percent of organizations. Because of economic necessity and other reasons, they are skeptical about innovating. The laggard category adopts greater than one standard deviation below the mean and accounts for the remaining 16 per cent. Organizations in this group have limited resources and can't take the risk of failure.

Given that organizations differ in their rate of adoption of computer technology, how can we expect the importance of issues to vary along this variable? For instance, because end user computing has been a phenomenon for quite some time now, we might expect that late adopters will see this as a bigger issue than early adopters who have already resolved the issue. On the other hand, we would expect the early adopters to place a greater emphasis on planning because it is a major delivery vehicle of new technology and on competitive advantage since we expect that early adopters are more prone to using information technology for competitive advantage. The specific hypothesis to be tested are:

HoA1: Late adopters rate end user computing the same as early adopters.

HoA2: Early adopters rate planning the same as late adopters.

HoA3: Early adopters rate competitive advantage the same as late adopters.

The alternate hypothesis are:

HaA1: Late adopters rate end user computing higher than early adopters.

HaA2: Early adopters rate planning higher than late adopters.

HaA3: Early adopters rate competitive advantage higher than late adopters.
As with the other demographic variables, an exploratory analysis will be performed to determine if any issues differ significantly between early and late adopters.

3.2.5. Emerging Issues

Two issues that haven't been included in any studies thus far are Systems Payoff and Organizational Impact. These are two issues which Sprague and McNurlin (1986) feel will become increasingly important through the 1990's. What importance will be attached to these issues?

Brancheau and Wetherbe (1987) have noted that global issues have spawned new important issues. For instance, information architecture was derived from data management as a separate issue in their study. What other other issues are emerging? Relational databases, shown to be insignificant in Brancheau and Wetherbe, have received much attention over the last few years. Given its strengths of data sharing and integration, we expect the relational database issue to increase in importance.

What issues are significant over and above those listed on the questionnaire? In a field as dynamic as MIS, one can expect to see new issues evolving as the capabilities of technology continue to grow. The unaided section of the questionnaire as well as the open ended question at the end of Section 3 should provide a barometer of tomorrow's issues.
3.3. QUESTIONS RELATED TO METHODOLOGY

How does methodology affect the results? (see Figure 2 for framework). The two primary methods used to date have had respondents either rank their choices from most to least important or to rate each issue independently of the others either on a numerical scale or on a semantic differential type scale based upon agreement or disagreement with a prescriptive statement. All previous research has presented the issues in terms of normative statements which might affect the results. This research also includes issues presented in purely descriptive terms (see Appendix 2 - Section 3).

Four methodologies (Sections 2 - 5 of the questionnaire) are utilized in this study to obtain a respondent's opinion of the degree of importance for MIS issues. Before seeing any prompts, the respondent is asked in Section 2 to list his top three issues in order. This is the unaided ranking method. The next three sections are aided in that the respondent sees descriptions of issues and is asked to indicate level of importance, rank of importance, or level of agreement. Section 3 asks for level of importance for an aspect of the systems function. Because a numerical scale is used, this method is referred to as the aided rating of descriptive issues method. Next the same activities are ranked in Section 4 from 1 to 10 which produces the aided direct ranking of descriptive issues method. Finally, Section 5 has respondents rate MIS action statements on a Likert type scale giving the aided rating of normatively stated issues method. As shown in Figure 2, we have six relationships between the 4 methods with the following hypothesis:
HoM1: There is no relationship between aided and unaided methodologies.

HoM2: There is no relationship between rating and ranking methodologies.

HoM3: There is no relationship between rating with issues presented as descriptions and rating with issues presented in normative statements.

The alternative hypotheses are:

HaM1: There is a relationship between aided and unaided methodologies.

HaM2: There is a relationship between rating and ranking methodologies.

HaM3: There is a relationship between rating with issues presented as descriptions and rating with issues presented in normative statements.

In addition to comparing the entire lists for each methodology, individual issues will be examined for large fluctuations.

One additional test related to methodology will be performed on the reliability of the questionnaire. The question can be raised that after the respondent has answered ten pages of questions, fatigue, inattention or time constraints will set in and the answers will not accurately reflect true opinions. To guard against these limitations, one question was duplicated on pages 8 and 9. To what extent will the answers vary for this question?
CHAPTER 4. METHODOLOGY

4.1. OVERVIEW - THE TOTAL DESIGN METHOD

The questionnaire was selected as the primary methodology for this research with follow up interviews as the secondary and complementary methodology. The questionnaire is appropriate in situations where large numbers of subjects are involved since it would be impractical to meet individually with the 632 persons included in the study. Further, the questionnaire gives the subject the opportunity to think about his answers in a time convenient to him, whether it be at home or in the office. Questionnaires also can be designed with the use of rating scales which allows for the application of statistical methods on the combined responses.

The main disadvantage with questionnaires is that they tend to only capture surface or quantitative data. In our research, for example, we can determine degree of importance for any individual issue. What we cannot ascertain is the underlying thinking that goes along with a given score. For this reason, the research design has augmented the initial questionnaire with follow up interviews intended to determine specific explanations for why we are seeing the statistical results.

Naturally, it is important that techniques be employed to maximize the response rate from a survey. The Total Design Method as put forth by Dillman (1978) states that both content of the questionnaire and the manner in which it is
executed must be handled competently. For content, Dillman advises that we think about why people respond to surveys and use this as design criteria. The three main principles to be followed along with an explanation of how this research incorporated them are now discussed.

1. Minimize the cost of responding. The main cost to a respondent is time so care was taken to keep the time required to 20 - 25 minutes. Another aspect of cost is the mental effort required. Questions were posed in a clear and concise manner. As well, open ended questions were minimized with only 4 of one hundred used being this style. To facilitate the completion of the questionnaire, examples and clear directions were included with each section.

2. Maximize rewards for responding. Short of sending along a sum of money, there are no tangible rewards available in a survey. Although one United States study of MIS Issues actually sent a dollar bill to each subject, the financial means of this research was more modest. However, several intangible rewards were used. The covering letter developed rapport with the recipients by stating that he was part of a special study and asking for their expert opinions. A form of a reward is to make the questionnaire interesting. Here we were aided by a study that is examining the topical MIS issues of the day and therefore appealed to many recipients. Another major reward used was to offer to share the results of the study. Therefore, there was useful information available through participating in the study.

3. Establish trust. Again, a number a techniques were used to realize this principle. First, the covering letter contained the signatures of both the DPMA president and CIPS president. Since most members know them, or at least know who they are, they could be sure that this study had received their full
endorsement. Confidentiality, although not a major concern in this study, was nonetheless guaranteed to respondents so that they could be sure that no individual responses would be made public. Finally, trust was established by outlining some of the good uses to be made of the results such as for input into planning future CIPS and DPMA meetings and for learning from each others’ general experiences. The recipients could then see that the study was not being conducted for personal gain or anything motivated by competition.

Execution of the survey is the second main ingredient for a successful response rate. This means shaping all administrative aspects of the survey process to maximize response. The key here is to plan ahead and ensure that all tasks are identified. For instance, our plan included a follow up card to be sent ten days after the initial mailing. This was printed and labelled at the same time as the first materials were prepared so that there were no delays in getting the follow up card mailed at the critical time identified. Dillman stated that follow up reminders are crucial to a good response rate. In addition to the follow up card mentioned above, two other reminders were used - a notice in the CIPS newsletter about a month after the initial mailing and another personalized letter to those who hadn’t responded about six weeks after the initial mailing.

4.2. THE COVERING LETTER

Great care was taken to ensure that the covering letter had a professional and personalized appearance. The letter was printed on UBC letterhead utilizing the university crest along with the Faculty of Commerce and Business Administration
name and address (Appendix 1). The letter was personalized in several ways. First, the subject’s full name, address and salutation was merged with the body of the letter. The print was top letter quality using the UBC laser printer. Three signatures appeared on the bottom of the letter, namely those of the presidents of both CIPS and DPMA along with that of Professor Dexter. Although signatures’s were not original, signature stamps were used to give a professional look.

The content of the letter was of course aimed at convincing the subject to respond. The first paragraph introduced the study and stated the importance for conducting it. The importance was purposely linked with CIPS and DPMA conferences by making the point that the results could help in determining the topics and agenda for upcoming meetings.

The second paragraph mentioned the participation of their society in the research. This was to give the impression that we had the full support of CIPS and DPMA. The time required was estimated at 20-25 minutes which is considered a nominal amount of an individual’s time. This paragraph also made a plea to the respondent’s duty as a professional in MIS in that they were told that their participation was essential in obtaining quality results. The paragraph ended by pointing out that a pre-stamped reply envelop was included. This was to minimize the cost of responding.

The third paragraph gave two incentives for the subjects to respond. First, the results of the study were promised through CIPS and DPMA. Second, complete
confidentiality was guaranteed for each individual response.

The closing paragraph asked for their response by a specific date. It was felt that this would avoid some questionnaires being lost in the "out basket". Professor Dexter's phone number was listed to show that we were sincere in this study by being available to answer any questions. Finally, the subject was given a warm thank you in advance for their valued participation in the study.

4.3. THE QUESTIONNAIRE

Every attempt was made to give the questionnaire an attractive appearance (Appendix 2). A booklet was produced with the contents professionally printed. A cream colour was chosen to distinguish this document from other white paper that might be on the recipient's desk. The cover page included references to UBC, the Faculty of Commerce and Business Administration and the title of the study. A picture of the clock tower and library, a landmark at UBC, was placed on the cover to provide extra appeal to the many UBC alumni included in the study.

The questionnaire itself consisted of five sections. The demographic questions were asked first because these questions were easiest and it is important to get the subject involved quickly since most people who begin surveys also complete them. The demographics were presented similarly to other CIPS surveys (ie. industry categories) to facilitate completion. The size variable was operationalized with two measures: company sales and DP professionals both inside the DP department
and within client departments. The position variable was supported by questions related to present job title and title of the person to whom the subject reports.

Section 2 asked subjects to rank (in order) their three most important issues that they felt were facing their organization over the upcoming 2-3 years. Importance was specifically defined as the amount of resources they planned to utilize in addressing the issue. By focusing the questions on behavioral intentions, we hoped to learn which issues will actually receive organizational attention and resources in the near future - not just which issues are seen to be important in principle. The major difference between Section 2 and the other sections is that there were no prompts or aids used to bias the response. This was also to generate useful anecdotal information for determining underlying aspects to the issues. Subjects were specifically requested not to look ahead to the remaining sections before completing Section 2.

Section 3 used the same instructions as Section 2 in terms of its phrasing and definition of importance. The issues were presented with a label describing an issue or area within MIS along with a description to describe that area. A seven point numerical scale used not important and extremely important as its anchors with average importance in the middle. To improve the understandability of the instructions, an example describing how to answer a typical question was included. The end of Section 3 included an open ended question asking for any additional issues which the subject felt were not captured by the 29 issues described in this section.
Section 4 was similar to Section 3 except now subjects were asked to rank only their top 10 issues from 1 to 10 in order of importance. Although only the labels were used, subjects were encouraged to return to Section 3 for the description if they needed to better understand the issue. The main reason for including Section 4 was to force the subject to prioritize the issues. In Section 3, for example, several issues may have been rated as extremely important. Section 4 forced a priority in that only 1 issue could be rated 1, 2, etc.

Section 5 was similar to Section 3 in that it used a 7 point scale. However, there were many differences. Rather than base importance on amount of resources used in addressing the issue, subjects were asked to indicate their level of agreement as they pertained to their organization. The issues were presented without labels, rather with normative, perscriptive statements, taken mainly from previous research. The anchors on the 7 point Likert type scale were also changed to strongly agree to strongly disagree.

4.4. THE FOLLOW UP PROCESS

A major ingredient for a good response rate is a well executed follow up process. In fact, Dillman (1978) found that "without follow up mailings, response rates would be half those normally attained." Ten days after the initial survey package was sent, a follow up card (Appendix 3) was mailed to all persons on the original mailing. The first paragraph expressed the wish that they had received the questionnaire and thanked those who had already responded. This

1 Reference 14 - p.180
gave the impression that many CIPS and DPMA members were participating in the research and that those who hadn't yet responded were being left out. The second paragraph gave Professor Dexter's phone number in case of questions or loss of survey. All calls were answered personally.

About the same time that subjects received the follow up card, the CIPS subjects received their monthly newsletter. This contained another reminder (Appendix 4) and also an upbeat status report of a good response rate. The results were again promised to the professional societies.

The initial survey was mailed in late November and therefore was caught in the Christmas mail rush. Also, people tend to take vacations in the latter part of December. For these reasons, it was decided to send a third notice (Appendix 5) to subjects early in January. The original survey booklets had been numbered so that they could be identified with individuals. We were therefore able to send personalized reminders to only those persons who hadn't responded. This letter was very similar to the original covering letter in its appearance and content.

4.5. THE INTERVIEWS

After the data was analyzed, there were a number of results which were difficult to interpret. For this reason, four follow up telephone interviews were conducted to provide explanations and to add to the anecdotal information which had been extracted from the unaided section of the survey. Each interview subject was a senior manager with questions posed based on the responses they
had given on the questionnaire. The information gained from the interviews has been merged with the results derived from the questionnaire and is presented in the results section of this thesis.
CHAPTER 5. ANALYSIS AND RESULTS

5.1. SURVEY RESPONSE RATE

Table 2 summarizes the results of the survey mailing. There were 632 sent of which approximately 75 per cent were CIPS members with the other 25 per cent belonging to DPMA. Some subjects were members of both organizations. In these cases only one survey was sent. No attempt has been made to compare the two professional societies.

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</tbody>
</table>

Response Rate 42.7%

Table 2. RESPONSE RATE SUMMARY

Nineteen were returned because the subject’s address was incorrect. Another 10 telephoned to say they could not respond for reasons such as they were vendors or held positions outside of the IS function. This left 603 eligible for responses. Of these, we received 257 for a response rate of 42.7 per cent (the previous
research reviewed had response rates between 30 and 60 per cent). Only 253 surveys are used in the analysis since two surveys were returned with pages missing and two subjects actually returned another survey. The latter point suggests that people are being over surveyed which may explain why our response rate was lower than the 70 per cent rate which the Total Design Method had predicted.

By keeping track of the date on which we received each response, it is possible to attribute the returned surveys to the prompt or notice which was sent to the subject with the results displayed in Table 3.

<table>
<thead>
<tr>
<th>PROMPT</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Letter</td>
<td>133</td>
<td>52.6</td>
</tr>
<tr>
<td>Second Letter &amp; Newsletter</td>
<td>81</td>
<td>32.1</td>
</tr>
<tr>
<td>Third letter</td>
<td>39</td>
<td>15.3</td>
</tr>
<tr>
<td>Total</td>
<td>253</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 3. RESPONSE RATE BY PROMPT

Just over half of the responses were received from the original survey package containing the covering letter. An additional 32 per cent were mailed to us after the follow up card and CIPS newsletter notice had been communicated. A final 15 per cent was received after the third notice was sent. This demonstrates how persistent follow ups results in an improved response rate. For instance, the response rate would have been only 33 per cent without the final notice.
5.2. DESCRIPTIVE RESULTS

The responses can be further broken down by each of the four demographic variables earlier described in Figure 1. Table 4 gives a breakdown of the 253 responses by industry.

<table>
<thead>
<tr>
<th>INDUSTRY</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer (excl. computers)</td>
<td>19</td>
<td>7.9</td>
</tr>
<tr>
<td>Computer Manufacturer</td>
<td>22</td>
<td>9.1</td>
</tr>
<tr>
<td>Education/Government</td>
<td>39</td>
<td>16.1</td>
</tr>
<tr>
<td>Finance</td>
<td>22</td>
<td>9.1</td>
</tr>
<tr>
<td>Transportation</td>
<td>11</td>
<td>4.6</td>
</tr>
<tr>
<td>Retail/Wholesale Trade</td>
<td>19</td>
<td>7.9</td>
</tr>
<tr>
<td>Utility</td>
<td>9</td>
<td>5.8</td>
</tr>
<tr>
<td>Consulting</td>
<td>54</td>
<td>22.4</td>
</tr>
<tr>
<td>Other</td>
<td>40</td>
<td>16.6</td>
</tr>
<tr>
<td>Total</td>
<td>240</td>
<td>100.0</td>
</tr>
<tr>
<td>No Response to this Question</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>253</td>
<td></td>
</tr>
</tbody>
</table>

Table 4. RESPONDENTS BY INDUSTRY

The largest industries are consulting and the non-profit sector with the industries of manufacturer, computer manufacturer, finance, trade, transportation and utilities each accounting for between 5 and 10 per cent of the remainder.

The breakdown by respondent's position is given in Table 5.

Here the largest group is middle managers followed closely by top managers. Approximately 60 per cent of responses came from subjects classifying themselves
### Table 5. RESPONDENTS BY POSITION

<table>
<thead>
<tr>
<th>POSITION</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top Management</td>
<td>53</td>
<td>22.1</td>
</tr>
<tr>
<td>Middle Management</td>
<td>60</td>
<td>25.1</td>
</tr>
<tr>
<td>First Line Management</td>
<td>31</td>
<td>13.0</td>
</tr>
<tr>
<td>Consultant</td>
<td>38</td>
<td>15.9</td>
</tr>
<tr>
<td>System Developer</td>
<td>35</td>
<td>14.6</td>
</tr>
<tr>
<td>Other</td>
<td>18</td>
<td>7.5</td>
</tr>
<tr>
<td>Total Categorized</td>
<td>239</td>
<td>100.0</td>
</tr>
<tr>
<td>No Response to this Question</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>253</td>
<td></td>
</tr>
</tbody>
</table>

as a manager. The remainder is split between system developers (ie. programmer analysts) and consultants.

The breakdown of companies by size deserves some explanation. Here we were interested in two extremes; namely small and large. Using the two measures of size on the questionnaire, company sales and DP professionals, we separated small from large by an order of magnitude. Therefore, small organizations are those with less than $10,000,000 in sales and less than 10 DP professionals. Large organizations are defined as those having greater than $100,000,000 in sales and greater than 100 DP professionals. Using this scheme, we have 30 small companies and 53 large ones. We used this dichotomy later in the analysis based upon size. This data is seen in Table 6.

The large group of 53 per cent which represents the medium sized organizations...
### Table 6. RESPONDENTS BY SIZE

<table>
<thead>
<tr>
<th>SIZE</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>53</td>
<td>30.0</td>
</tr>
<tr>
<td>Small</td>
<td>30</td>
<td>16.9</td>
</tr>
<tr>
<td>Medium</td>
<td>94</td>
<td>53.1</td>
</tr>
<tr>
<td>Total Categorized</td>
<td>177</td>
<td>100.0</td>
</tr>
<tr>
<td>No Response to this Question</td>
<td>76</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>253</td>
<td></td>
</tr>
</tbody>
</table>

is not used in this portion of the analysis since we are interested in determining if differences exist between the two extreme size categories of small and large.

The adopter classification is shown in Table 7.

Again we are interested in two extremes. Early adopters are those who feel they adopt and use technology either first in their industry or far ahead of average. This includes the innovator and early adopter categories from the demographic section of the questionnaire. Late adopters are those who adopt later than the average rate for their industry and includes the late majority and laggard categories. A far greater proportion of respondents consider their company to be early adopters versus late. This may reflect a phenomenon known as normative bias where respondents answer based on the situation they would like to have, not on what is actually in place.
5.3. RESULTS RELATED TO METHODOLOGY

The questionnaire was designed to obtain the importance of MIS issues from each subject using the four methodologies. Section 2 of the questionnaire is the unaided ranking method, Section 3 is the aided descriptive rating method, Section 4 is the aided ranking method and Section 5 is the aided normative rating method. Each method produces a ranking of the issues from highest to lowest with the results presented in Table 8.

The construction of the rankings was straightforward for both of the aided ratings methods. The scores were merely added for each issue and averaged for all respondents with the highest average first, second highest second, and so on for the 29 issues. For aided ranking, only the top ten were ranked by each respondent. Therefore, the issues not ranked were given a score of 20, the midpoint between 11 and 29. Then the scores for each issue were averaged for respondents with the lowest score getting the highest rating. The first step in compiling the unaided rankings of Section 2 was to map the written descriptions
<table>
<thead>
<tr>
<th>ISSUE DESCRIPTION</th>
<th>AID RATE</th>
<th>UNAID RANK</th>
<th>AID RANK</th>
<th>AID RATE</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Management</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Planning</td>
<td>3</td>
<td>8</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Integration of Technologies</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Software Development</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Data Security</td>
<td>10</td>
<td>18</td>
<td>8</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Competitive Advantage</td>
<td>7</td>
<td>9</td>
<td>6</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>End User Computing</td>
<td>2</td>
<td>12</td>
<td>4</td>
<td>18</td>
<td>7</td>
</tr>
<tr>
<td>Educating Senior Personnel</td>
<td>11</td>
<td>15</td>
<td>14</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Telecommunications Technology</td>
<td>6</td>
<td>3</td>
<td>7</td>
<td>17</td>
<td>9</td>
</tr>
<tr>
<td>Productivity</td>
<td>8</td>
<td>6</td>
<td>11</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>Quality Assurance</td>
<td>9</td>
<td>14</td>
<td>10</td>
<td>16</td>
<td>13</td>
</tr>
<tr>
<td>Fourth Generation Languages</td>
<td>13</td>
<td>13</td>
<td>9</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>Information Architecture</td>
<td>20</td>
<td>16</td>
<td>13</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>Relational Databases</td>
<td>12</td>
<td>24</td>
<td>17</td>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td>Organizational Location</td>
<td>18</td>
<td>22</td>
<td>21</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Systems Payoff</td>
<td>15</td>
<td>19</td>
<td>20</td>
<td>14</td>
<td>16</td>
</tr>
<tr>
<td>Decision Support Systems</td>
<td>14</td>
<td>25</td>
<td>19</td>
<td>19</td>
<td>17</td>
</tr>
<tr>
<td>Packaged Software</td>
<td>17</td>
<td>26</td>
<td>12</td>
<td>25</td>
<td>18</td>
</tr>
<tr>
<td>Organizational Impact</td>
<td>23</td>
<td>21</td>
<td>24</td>
<td>7</td>
<td>19</td>
</tr>
<tr>
<td>Information Centres</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>23</td>
<td>20</td>
</tr>
<tr>
<td>Office Automation</td>
<td>21</td>
<td>20</td>
<td>15</td>
<td>22</td>
<td>21</td>
</tr>
<tr>
<td>Centralization/Decent.</td>
<td>24</td>
<td>10</td>
<td>16</td>
<td>21</td>
<td>22</td>
</tr>
<tr>
<td>Applications Portfolio</td>
<td>19</td>
<td>11</td>
<td>23</td>
<td>20</td>
<td>23</td>
</tr>
<tr>
<td>Organizational Learning</td>
<td>25</td>
<td>5</td>
<td>26</td>
<td>11</td>
<td>24</td>
</tr>
<tr>
<td>Recruiting and Training</td>
<td>22</td>
<td>7</td>
<td>22</td>
<td>26</td>
<td>25</td>
</tr>
<tr>
<td>Measuring Productivity</td>
<td>26</td>
<td>28</td>
<td>29</td>
<td>24</td>
<td>26</td>
</tr>
<tr>
<td>External Data</td>
<td>27</td>
<td>29</td>
<td>28</td>
<td>27</td>
<td>27</td>
</tr>
<tr>
<td>Expert Systems and AI</td>
<td>28</td>
<td>23</td>
<td>27</td>
<td>28</td>
<td>28</td>
</tr>
<tr>
<td>Factory Automation</td>
<td>29</td>
<td>27</td>
<td>25</td>
<td>29</td>
<td>29</td>
</tr>
</tbody>
</table>

Table 8. MIS ISSUES BY METHODOLOGY
onto the 29 issues as described in Section 3. In some cases, the choice was obvious while in others the description would overlap two or more issues. For the latter, the mapping was made to the issue closest to the description. To ensure that the mapping was not overly biased, a sample of 20 per cent of the responses were coded independently by concealing the allocation previously made. Of 138 possible matches, 73, or 53 per cent, were identical. Using the results of this sample, it is possible to construct a confidence interval of the percentage of matches we expect for all 253 surveys. Therefore, with 95 per cent confidence, the percentage is in the range of 45 - 61 per cent. The remainder of the rankings for this method were constructed in the same manner as the aided rankings of Section 4 except here an issue not ranked was given a score of 16.5, the mid point between 4 and 29.

To test the hypothesis concerned with the relationships between rankings, a Spearman Rank correlation test was performed on each of the pairs of rankings. The summary of statistics is shown in Table 9.

For the hypothesis HoM1 which states that there is no relationship between aided and unaided methodologies, we can observe that the correlation coefficients between aided (Sections 3-5) and unaided (Section 2) range from .63 to .50. The probability of finding a relationship this close due to chance would be p < .006 to p < .0006. Since this is significant, we reject the null hypothesis and accept HaM1 which concludes that there is a relationship between unaided and each of the aided methodologies.
Table 9. SPEARMAN CORRELATION COEFFICIENTS

<table>
<thead>
<tr>
<th></th>
<th>Section 2</th>
<th>Section 3</th>
<th>Section 4</th>
<th>Section 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section 2</td>
<td>1.00</td>
<td>.60 ***</td>
<td>.63 ***</td>
<td>.50 **</td>
</tr>
<tr>
<td>Section 3</td>
<td></td>
<td>1.00</td>
<td>.91 ***</td>
<td>.64 ***</td>
</tr>
<tr>
<td>Section 4</td>
<td></td>
<td></td>
<td>1.00</td>
<td>.58 ***</td>
</tr>
<tr>
<td>Section 5</td>
<td></td>
<td></td>
<td></td>
<td>1.00</td>
</tr>
</tbody>
</table>

** p < .01
*** p < .001

The second hypothesis, HoM2, states that there is no relationship between rating and ranking methodologies. Here we find the Spearman rank correlation coefficient at .91. There is less than a 1 in 10,000 probability that this is due to chance alone so we reject the null hypothesis and accept HaM2 which concludes that these two methodologies give consistent results.

The third and final methodology hypothesis, HoM3, concerned the relationship between rating issues presented as descriptions and issues presented as normative statements. The correlation coefficient was .64 between these methods with p < .0002. Again, we reject the null hypothesis and conclude that the relationship is significant.

Although the rankings as a whole may show significant relationships, it is still possible for individual issues to vary from one method to another. Consistent with the Spearman coefficient of .91, there is not much variation between aided descriptive ratings and aided descriptive rankings. An interpretation is that the order of Section 3 could predict 83 per cent (the square of the correlation coefficient)
coefficient) of the order of Section 4. We would expect this since the issues are presented identically as are the instructions. There is greater variation between aided descriptive rating and aided normative ratings. Here the order of Section 3 could predict only 41 per cent of the order of Section 5. The main difference lies in the amount of resources that will be used in addressing the issue since the instructions for section 3 specified this while the instructions for section 5 simply asked for level of agreement. Therefore an issue rated highly on Section 5 is considered important irrespective of immediate priorities. Issues in this category, as displayed in Table 8, are data security, educating senior personnel, and organizational learning. One possible interpretation of this result is that although considered important, the subjects are not planning to allocate immediate resources because they are not sure about how to address the issue.

On the other hand, issues rated highly in Section 3 but lower in Section 5 mean that the issue is considered less important overall; however considerable resources are nonetheless intended over the next 2-3 years to improve effectiveness. Issues falling into this category include integration, telecommunications, competitive advantage, end user computing, and quality assurance. This group of issues will nonetheless have substantial resources allocated although they are perceived as less important.

It could be argued that there is an element of bias in the above analysis. This is because the same respondent answers Sections 3, 4 and 5. Therefore, a split half analysis was performed by computing ranks for different halves of the returned surveys. The Spearman Rank Correlations are shown in Table 9A.
<table>
<thead>
<tr>
<th>Section 3</th>
<th>Section 4</th>
<th>Section 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st half</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>.87 ***</td>
<td>.87 ***</td>
</tr>
<tr>
<td>2nd half</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>.62 ***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Section 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st half</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>.82 ***</td>
<td>.91 ***</td>
</tr>
<tr>
<td>2nd half</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>.55 ***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Section 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st half</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>.47 ***</td>
<td>.43 *</td>
</tr>
<tr>
<td>2nd half</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>.78 ***</td>
</tr>
</tbody>
</table>

* p < .05
*** p < .001

Table 9A. SPEARMAN CORRELATION COEFFICIENTS

The rankings for the first half for Section 3 correlates with the second half for Sections 4 and 5 with coefficients of .87 and .62 respectively. This is extremely close to the previous analysis for all respondents where the coefficients were .91 and .64. With a probability < .001 that this would occur due to chance, we conclude that the sections measure the same construct. It is also seen from Table 9A that the first half of each section correlates highly with the second half of the same section which is what we would expect given that the two halves were selected randomly.

While the Spearman statistic is useful for relationships between pairs, it is interesting to find a measure of the relation among several ranking methods. The unaided rankings of Section 2 are excluded for this test since we are concerned with the stability of the three aided methodologies in tapping the same construct and because Section 2 is somewhat subjective because interpretation was needed in mapping the issues. Therefore, only the aided sections are used in the following analysis.
Kendall's Coefficient of Concordance (Table 10) is appropriate for determining the relationship among several methods and gives a value \( W = 0.71 \) (see Appendix 6 for calculation) which is the average correlation coefficient between each pair of methods. A Chi Square test gives a result of 59.6 with \( p < 0.001 \) among sections 3 - 5. The high value of \( W \) means that the subjects are applying essentially the same standard in scoring the issues over 3 methodologies. In this case, according to Siegel (1956), "the best estimate of the true rankings is obtained by the order of the various sums of ranks." This is presented as the rightmost column of Table 8.

<table>
<thead>
<tr>
<th></th>
<th>Section 3</th>
<th>Section 4</th>
<th>Section 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section 3</td>
<td>1.00</td>
<td>0.77</td>
<td>0.50</td>
</tr>
<tr>
<td>Section 4</td>
<td>1.00</td>
<td></td>
<td>0.41</td>
</tr>
<tr>
<td>Section 5</td>
<td></td>
<td></td>
<td>1.00</td>
</tr>
</tbody>
</table>

\[ W = 0.71 \]
\[ p < 0.001 \]

Table 10. KENDALL CORRELATION COEFFICIENTS

A common criticism of surveys is that information collected from respondents may not be representative of non-respondents. This can cause problems in drawing conclusions about the population. While this research did not investigate non-respondents directly, a comparison was made between those subjects who responded after the initial mailing and those who needed the additional prompts to respond. Using Section 3 of the questionnaire, rankings were constructed for each of the two groups. A Spearman correlation coefficient of 0.91 was calculated meaning that the order of the early responders could predict 83 per cent of the

\( ^1 \) Reference 14 - pg. 237
late responders. The probability of obtaining this by chance is 1 in 10,000 so we conclude that there is a strong relationship between early and late responders with the implication that there is also a strong relationship between responders to the survey and non-responders.

The final analysis for this section is intended to provide a measure of reliability for the questionnaire itself. A test of reliability was run on the issue which was randomly repeated at the end of the survey with a reliability coefficient calculated at .81. Although not a complete test of internal reliability, this high level of correlation suggests that subjects were still interested in the content as they approached the end and that consistent responses were generally given.

5.4. RESULTS RELATED TO MIS ISSUES

5.4.1. The Top Ten Issues in Vancouver

Introduction - This section is intended to provide descriptions of the top ten issues as perceived by a representation of all respondents to the survey. Here we use the comments from the unaided section of the survey. The top rated issue, data management, was specified by 52 respondents as being in the top three issues while the tenth ranked issue, productivity, was specified 44 times. Other comments for this section were obtained through the follow up interviews.

1. Data Management - The top rated issue involves managing data so that it can be accessed and utilized appropriately. This was expressed in a variety of
ways. A middle manager in a manufacturing company perceives the issue as "providing access to all corporate data to all users in the organization." A senior systems analyst in a finance company felt that "before new technology is acquired and implemented, corporate data needs must be well managed and, above all, understood." Accuracy, completeness, control and integration of data were some of the other points emphasized for the data management issue.

2. Planning - This issue concerns the development of IS plans to support the organization's strategies. In the words of a top manager in the Oil and Gas industry, "the issue of strategic information planning involves aligning MIS planning with the strategic direction of the business." "Orient IS and services towards business objectives" was the top issue from a 1st line manager at a utility. Some other dimensions of the planning issue were the use of technology to contribute to the financial performance of the enterprise and the need for IS plans to match corporate goals and respond to business needs. One data analyst in the non-profit sector expressed the planning issue with a data orientation: "Implement the MIS strategic plan to deliver corporate data bases, data acquisition systems and data application systems."

3. Integration - This issue involves integrating data processing, telecommunications, office automation and other technologies. A top manager with a consulting firm noted the "growing integration requirements between application software and telecommunications." A middle manager in the non-profit sector saw the integration issue as "integrating new emerging technologies into existing environments (hardware, software, development engineering tools)." A large
multi-national computer manufacturer perceived integration as an opportunity by "standardizing computer technology in terms of operating systems, communication protocol and peripheral interfaces." Personal computers were included with the integration issue by a number of respondents: "the ability to connect PC based LAN's into a major network, linking different LAN's together and providing access to host run applications."

4. Software Development - Building and implementing software programs for the organization was perceived in many ways. Converting old to new "by replacing core application systems with state-of-the-art online systems using DBMS" was the opinion of a middle manager in the non-profit sector. A 1st line manager emphasized the need for an infrastructure: "upgrade the technical environment (hardware and software) to establish a sound base foundation on which to build new applications, thereby allowing unencumbered business growth." The issue of cost and schedule were linked to this issue: "Develop application software according to senior management's timetable" and "Can we afford to develop our own in-house systems or do we need to adapt an alternative strategy of a joint venture, use of a service bureau, etc."

5. Data Security - This issue has to do with ensuring that data is not inappropriately altered, destroyed, or disclosed to unauthorized persons. A disaster recovery plan was included with this issue with a top manager in manufacturing noting: "once a manufacturing plant becomes fully automated, then a single processor causes a problem". A middle manager in the non-profit sector pointed out two factors which are increasing the need for data security: "increasingly
sophisticated criminals and public demand for greater privacy over personal data."
A 1st line manager in finance saw the issue as "obtaining proper senior level
support in addressing computer security issues." Personal computers were also
perceived as contributors to the security problem since large amounts of data are
stored with often little in the way of controls.

6. Competitive Advantage - This issue concerns identifying and capitalizing on
opportunities to use systems to gain competitive advantage for the organization.
A middle manager in the forestry sector termed the issue "competitive edge -
using computer technology to gain an advantage over competing companies."
Differentiation and integration were two aspects of this issue. "The ability to
integrate IS into product offerings to provide marketing differentiation" was the
aim of a top manager of a computer manufacturer. A top manager in
transportation tied the competitive advantage issue to his firm's financial position:
"being able to use information and technology to differentiate our services from
our competition to improve our financial position." Another top manager perceived
the issue as "the use of the computer resource in dealing with external sources
(customers, etc.)."

7. End User Computing - The use of computing technologies by non-DP
professionals was stated in many ways. A top manager in construction perceived
the issue as "providing users with the tools to manipulate data to meet clients' 
needs." A middle manager in manufacturing tied the issue to competitive
advantage by "providing computer tools and utilities, and access to data to
sales/marketing staff to provide a competitive edge." Some concerns with end user
computing included data security and integrity and the effective control over end user systems development. A consultant questioned the impact of end user computing on the DP department. "I keep hearing about personal computing. Is DP really moving out of the DP department?"

8. Educating Senior Personnel - This issue involves improving senior managements' understanding of MIS, its role and the contribution MIS can make to the organization. A top manager in finance stated that "despite the fact that some key managers are on board and in tune, this still seems to be an on-going battle." The issue was often focused on the cost/benefits of systems. "Improve senior management's perception and understanding of the value of DP and automation" was a goal of a middle manager with a consulting firm. A manager with a computer manufacturer saw the issue as "convincing senior management to spend money in light of revenue problems." A system developer in manufacturing wanted to see "upper management commitment to MIS translated to resources."

9. Telecommunications - This issue was closely tied to the integration issue. A system developer with a computer manufacturer described it as "integration of the four forms of information: voice, data, image and text." The telecommunications network was the central theme of many responders. A top manager in manufacturing perceived the issue as "the ability to provide a high speed telecommunications network which is reliable and well serviced at reasonable cost." A top manager in trade saw the need for an overall telecommunications plan. "We need to implement a strategy encompassing all
types of communications (voice, data, etc.) to link current users to the upcoming systems."

10. Productivity - Taking steps to improve MIS productivity was described nicely by a top manager in trade. "Meeting the demand for more and better services and products (systems) with less resources, due to cost cutting measures, through better trained/skilled staff and the use of better tools." A consultant in trade saw technology as the key to productivity with the "efficient, cost effective implementation of computer systems, especially using networks, data bases, user developed tools and packaged software." A middle manager in the transportation sector perceived programmer productivity as the key. "Corporate policy is to restrict staff expansion, but to increase new applications. Therefore productivity improvements are essential."

5.4.2. Aggregation of Issues

The objective of this section is to determine whether a reduced set of underlying factors can explain the movement of the 29 issues. Because this work is exploratory, the number of factors is not known a priori and no claims are made about the factors causing the issues. Factor analysis using the maximum likelihood method with oblique rotations is used as the statistical tool for determining the common factors.

The first step in an exploratory factor analysis is to determine the number of factors present. An upper bound is found by progressively adding factors and
performing a Chi-Square after each factor has been added on the hypothesis that the number of factors is sufficient versus the alternative that more factors are needed. At ten factors the Chi-Square is calculated at 187.7. This results in a p-value of .07 which is not unlikely enough to reject the null hypothesis. Therefore, the upper bound is set at ten factors. A lower bound on the number of factors is determined by counting the eigenvalues which exceed the value of one. This generally works well when applied to samples from artificially created populations such as the one in this research. Using this rule, the lower bound is six factors. Since this is a more manageable number, the smaller number of factors was used in the ensuing analysis.

The next step in factor analysis is allocating the variables (issues) to the factors. Here the general criteria is to use factor loadings having standard regression coefficients greater than .3 with the values presented in Table 10A. Here F1, F2, etc. represent the six factors while COMM represents the communalities.

This results in the following factors:

**Data Management Issues** - This factor includes data management, information architecture, relational data bases and fourth generation languages. The latter issue can be viewed as the technology allowing access to data.

**End User Computing** - Information centres and the end user computing issue itself are included in this category. The other issues which load on this factor include organizational learning, packaged software and applications portfolio. The first issue has to do with learning the technology while the latter two are
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**WEIGHTED VARIANCE**

|                      | 5.7 | 6.6 | 5.9 | 7.5 | 3.6 | 8.9 |

Table 10A. FACTOR ANALYSIS RESULTS
application oriented.

**Strategic Issues** - The issues which load on this category are strategic in nature. They include the organizational location of MIS, planning, educating senior personnel, and the centralization/decentralization of services.

**Integration** - Only two issue loaded on this factor but they are closely tied. The integration of technologies is coupled with the telecommunications issue to form this group.

**Productivity and People** - The three main productivity issues load on this factor: systems payoff, measuring productivity and improving productivity. The people issues of organizational impact and recruiting and training are also in this group. Quality assurance, which is related to productivity through the use of standards, is the final issue in this group.

The sixth and final factor contained five issues with no common theme. These were data security, expert systems, office automation, external data, and competitive advantage. Three other issues did not load on any factor: software development, decision support systems, and factory automation. An interpretation of this might be that some of these issues may be more complex and therefore related or not related for quite subtle reasons.

However, subjective appraisal of the factor analysis finds that the issues load reasonably well. In fact, the five meaningful factors correspond closely with Sprague and McNurlin’s (1986) taxonomy with only software development not evident as a factor.
5.4.3. Trends

The results from all respondents from this study were previously presented on Table 8. However, many of the research questions concerning the trends of MIS issues involves comparisons with previous studies. Branchet & Wetherbe (1987) claim that 80 per cent of their sample were Chief IS Executives. Hartog and Herbert (1987) do not give a breakdown of their sample but addressed their survey to the "key IS man onsite". Since, both of these studies were aimed at senior management, a new set of rankings has been prepared by extracting only the top management category. This was possible because the questionnaire obtained the level of management from a respondent. The top level was taken to be an IS professional who reports to a person outside of the DP function. The rankings using the 53 managers who responded to the survey, are presented in Table 11 and will be used in all comparisons with previous work.

To obtain a measure of the relationship among the three methodologies for senior managers, the Kendall Coefficient of Concordance is again used with results shown on Table 11A.

The statistic W is calculated at .72 giving a Chi-Square value of 60.4. The probability of obtaining a value this large due to chance is less than 1 in a 1000. We therefore conclude that there is a strong relationship with the three methods. In this case, the best estimate of the true ranking is obtained by the order of the sums of ranks as shown in the right most column of Table 11.
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Table 11. MIS ISSUES FOR SENIOR MANAGEMENT
Table 11A. KENDALL CORRELATION COEFFICIENTS

To facilitate comparisons with previous research, tables were prepared showing only those issues in common. This research purposely included the top issues from previous studies to allow this. Therefore, Table 12 shows the relative rank between Brancheau and Wetherbe (1987), which includes their top 19 issues and three others, and this research.

While Brancheau and Wetherbe found that strategic issues such as organizational learning and educating senior personnel were increasing, this research has found them less important. Brancheau and Wetherbe found end user computing and the related issues of office automation and decision support systems decreasing, probably "due to the positive effects of research, education and experience".¹ This research has found end user computing stable but the related issues of office automation and decision support system showing large increases in importance compared to Brancheau’s work. The trend towards lower importance placed on measuring productivity and recruiting and training is supported by this research. Contrary to Brancheau’s conclusion that integration, software development, packaged software and applications portfolio were becoming less important in the opinions of senior management, this research has found them to

¹ Reference 3 - pg. 30
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Table 12. COMPARISON - BRANCHEAU VS GRAHAM

be increasing substantially.

An interpretation of the above may be found by examining the issues in the categories of management/enterprise (ME) versus technology/application (TA). Of the 10 ME issues on Table 12, one has increased in importance, one has
remained the same while 8 have decreased. There is a net loss of 44 places for ME issues, an average of 4.4 for each issue. Of the 11 TA issues, all but two have increased in importance and of course the TA issues have gained the 44 places that ME have lost. This analysis suggests that our Vancouver senior managers may be getting back to basics; turning their attention and efforts from getting the IS function understood and respected by the rest of the organization to dealing with such basic issues as developing software effectively and integrating the various technologies and applications.

Another explanation for the above difference may lie in the way in which the issue was presented. Some issues like educating senior personnel, organizational location and organizational learning sound more important when presented as normative or action statements. This can be seen in Table 11 by the higher rankings given these issues for Section 5 than Sections 3 or 4 where the issue was presented in descriptive terms. In fact, if just section 5 were used for this analysis, the ME issues would have lost 35 places. As well, Brancheau and Wetherbe were using a Delphi technique which seeks consensus and it is possible that a halo affect may be involved with these rankings.

Table 13 compares this research with that of Hartog and Herbert (1986 B). All issues from their study except one (telecommunications deregulation) were included in this research to facilitate comparison of the 22 issues.

Contrary to their main conclusion, this research has found that end user computing has not declined; indeed, it has increased in importance. Managers do
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</tr>
<tr>
<td>Competitive Advantage</td>
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<td>4</td>
<td>+16</td>
<td>ME</td>
</tr>
<tr>
<td>Data Security</td>
<td>11</td>
<td>5</td>
<td>+6</td>
<td>TA</td>
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<td>Software Development</td>
<td>4</td>
<td>6</td>
<td>-2</td>
<td>TA</td>
</tr>
<tr>
<td>End User Computing</td>
<td>12</td>
<td>7</td>
<td>+5</td>
<td>ME</td>
</tr>
<tr>
<td>Educating Senior Personnel</td>
<td>3</td>
<td>8</td>
<td>-5</td>
<td>ME</td>
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<td>Quality Assurance</td>
<td>9</td>
<td>9</td>
<td>0</td>
<td>TA</td>
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<td>Productivity</td>
<td>5</td>
<td>10</td>
<td>-5</td>
<td>ME</td>
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<td>Office Automation</td>
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<td>11</td>
<td>-1</td>
<td>ME</td>
</tr>
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<td>Telecommunications Technology</td>
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<td>-4</td>
<td>TA</td>
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<td>-12</td>
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</tr>
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<td>Decision Support Systems</td>
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<td>TA</td>
</tr>
<tr>
<td>Centralization/Decentraliz.</td>
<td>17</td>
<td>15</td>
<td>+2</td>
<td>ME</td>
</tr>
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<td>Fourth Generation Languages</td>
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<td>16</td>
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<td>TA</td>
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<td>Information Centres</td>
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<td>17</td>
<td>-3</td>
<td>ME</td>
</tr>
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<td>Recruiting and Training</td>
<td>13</td>
<td>18</td>
<td>-5</td>
<td>ME</td>
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<td>Measuring Productivity</td>
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<td>19</td>
<td>-1</td>
<td>ME</td>
</tr>
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<td>External Data</td>
<td>15</td>
<td>20</td>
<td>-5</td>
<td>ME</td>
</tr>
<tr>
<td>Expert Systems and AI</td>
<td>22</td>
<td>21</td>
<td>+1</td>
<td>TA</td>
</tr>
<tr>
<td>Factory Automation</td>
<td>21</td>
<td>22</td>
<td>-1</td>
<td>TA</td>
</tr>
</tbody>
</table>

Table 13. COMPARISON - HARTOG VS GRAHAM

not appear to have gained control over the security issue as this has increased by 6 places. Of the issues which Hartog felt were being raised by the alignment issue, only data management is supported by this research while telecommunications and educating senior personnel decreased. It was also noted
that the two largest differences were organizational location and competitive advantage (-12 and +15 respectively).

An analysis of ME versus TA issues produces similar results to the Branchau and Wetherbe study although not as strongly. Here we find that there is a net decrease of 9 places for management issues which is the amount which the technical/application issues have increased overall.

Table 14 presents an historical view of the core issues, those in common between the four main studies from 1983 - 1988. If an issue was not included in any one study, it was not included on this table. For example, quality assurance was not included in Dickson (1983) and Branchau (1986). As this issue placed 9th in Hartog (1986), removing it results in the 10th issue, office automation becoming 9th. Therefore, the rankings below are the relative ranks after excluding the issues not included in the others studies.

Planning and integration have remained consistently important over the years while recruiting and training have shown a steady decline. The latter point is possibly due to DP professionals becoming more abundant as academic institutions graduate larger numbers and also due to increased DP skills in organizations through such developments as end user computing. The issues which have shown a steady rise over the past six years have been data management and data security. End user computing was declining but a reversal now appears evident, at least for the MIS community in Vancouver.

Table 14A presents Kendall’s Coefficient of Concordance for the core issues
### Table 14. COMPARISON OF CORE ISSUES - 1983-88


The average correlation coefficient is .23 giving a W statistic of .27 and a Chi-Square of 13.0. The probability of obtaining a value this large due to chance is p < .37, an insignificant relationship among the four studies. Although other differences exist besides time, the degree of concordance over time is not statistically significant.

There are some other interesting points about Table 14A. The highest correlation, found to be weakly significant (p<.09), is between Branchieu and Hartog which one might expect since they conducted their studies in the same year. The
Table 14A. SPEARMAN CORRELATION COEFFICIENTS

The lowest correlation is between Dickson and Hartog which reflects a temporal and methodology difference. Graham correlates about the same with each of the other three studies, probably due to the methodology used in this research which employed elements from each of the previous works.

5.4.4. Demographics and MIS Issues

The statistical model for Figure 1 has been developed by including the four independent variables (size, position, industry and innovator category) and a fixed term along with the dependent variable which is the rating for an issue. The model in mathematical terms appears below.

\[ Y = B_0 + B_1X_1 + B_2X_2 + \ldots + B_{17}X_{17} + E \]

where: X's are indicator variables of categories as follows:

- X1 is 1 if company is a computer manufacturer; otherwise 0
- X2 - manufacturer
- X3 - non-profit
Each independent variable in turn consists of a qualitative variable for each category. Size, for example, has the two categories of small and large corresponding to X9 and X10. The advantage of a model like this is that all tests can be made at once. We can test that the importance of an issue is the same for small companies as it is for large companies and this model will give us a result while holding the remaining effects such as industry and position constant.

**Size** - The results of the tests comparing large versus small companies are summarized in Table 15.

For the hypothesis HoS1, HoS2, and HoS3, we observe that large companies do rate planning, integration and telecommunications higher than small companies although none are significant at the p < .05 level. For data management (HoS4), there no significant difference with "wrong sign" indicating that small companies rate data management higher than large companies. The null hypothesis for size are not rejected and we conclude that there is no significant difference between large and small on these four issues tested.
<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>Alternate Hypothesis</th>
<th>Issue</th>
<th>p-value</th>
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</thead>
<tbody>
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<td>Large &gt; Small</td>
<td>Planning</td>
<td>.15</td>
</tr>
<tr>
<td>Large = Small</td>
<td>Large &gt; Small</td>
<td>Integration</td>
<td>.13</td>
</tr>
<tr>
<td>Large = Small</td>
<td>Large &gt; Small</td>
<td>Telecommunications</td>
<td>.13</td>
</tr>
<tr>
<td>Large = Small</td>
<td>Large &gt; Small</td>
<td>Data Mgmt</td>
<td>.14</td>
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</table>

**Ex Post Results**

<table>
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<th>Null Hypothesis</th>
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<th>Issue</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large = Small</td>
<td>Small &gt; Large</td>
<td>End User Computing</td>
<td>.04</td>
</tr>
<tr>
<td>Large = Small</td>
<td>Large &gt; Small</td>
<td>Measuring Productivity</td>
<td>.0001</td>
</tr>
</tbody>
</table>

Table 15. STATISTICAL TESTS ON SIZE

In exploring the data for significant differences, we looked for any issues where large companies were significantly different from small companies. The significant results are for end user computing which small companies have rated higher (p < .04) and measuring productivity which large companies have rated higher (p < .0001). The former result could mean that small companies place less emphasis in the DP shop and are concentrating more DP resources in the hands of users. The measuring productivity result could be due to the greater number of systems, and therefore greater potential for productivity, in large versus small companies.

Industry - The summary of tests made for industry is on Table 16.

Hypothesis HoI1 and HoS2 tests whether finance rates such strategic issues as planning and competitive advantage higher than manufacturing. These are not
<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>Alternate Hypothesis</th>
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<th>p-value</th>
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</thead>
<tbody>
<tr>
<td>Finance = Mfg</td>
<td>Finance &gt; Mfg</td>
<td>Planning</td>
<td>.47</td>
</tr>
<tr>
<td>Finance = Mfg</td>
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<td>Competitive Advantage</td>
<td>.32</td>
</tr>
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<td>.56</td>
</tr>
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<td>Mfg = Others</td>
<td>Mfg &gt; Others</td>
<td>Factory Automation</td>
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<td>Finance = Others</td>
<td>Finance &gt; Other</td>
<td>Expert Systems</td>
<td>.25</td>
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**Ex Post Results**

<table>
<thead>
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<td>Cons = Utility</td>
<td>Cons &lt; Utility</td>
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</tr>
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<td>Cons &gt; Mfg</td>
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<td>.02</td>
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<td>Finance = Utility</td>
<td>Finance &gt; Utility</td>
<td>Software Dev</td>
<td>.03</td>
</tr>
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<td>Utility = Non-Profit</td>
<td>Utility &gt; Non-Profit</td>
<td>Integration</td>
<td>.001</td>
</tr>
<tr>
<td>Trade = Cons</td>
<td>Trade &lt; Cons</td>
<td>Planning</td>
<td>.01</td>
</tr>
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<td>Finance = Other</td>
<td>Finance &gt; Other</td>
<td>Data Mgmt</td>
<td>.01</td>
</tr>
<tr>
<td>Mfg = Non-Profit</td>
<td>Mfg &gt; Non-Profit</td>
<td>DSS</td>
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<td>Utility &gt; Cons</td>
<td>Information Centre</td>
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<td>Utility = Non-Profit</td>
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<td>Office Automation</td>
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</tr>
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<td>Finance = Non-Profit</td>
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<td>External Data</td>
<td>.02</td>
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<td>Finance &gt; Others</td>
<td>Relational Database</td>
<td>.02</td>
</tr>
</tbody>
</table>

Table 16. STATISTICAL TESTS ON INDUSTRY

rejected due to the p-values of .47 and .32 respectively. The other test for the
strategic grid is manufacturing greater than finance for software development (HoI2). The result is not significant at the \( p < .56 \) level with the wrong sign meaning that finance rates this issue higher than manufacturing. We conclude that manufacturing companies do not rate software development higher than finance companies. For hypothesis HoI4, we find that the issue of factory automation is indeed industry specific as manufacturing rates it significantly higher than other industries \( (p < .0001) \). Hypothesis HoI5 is not rejected in that the financial sector does not rate expert systems as more important issue than other industries.

In exploring the data, at least 24 of the 29 issues have significant differences \( (p < .05) \) based on some sort of industry categorization, although with 8 industry categories, we would expect many differences. Some of the results have a high degree of face validity such as non-profit companies rating competitive advantage and system payout lower than the average of other industries. Others show interesting patterns such as finance rating data management and relational databases higher than other industries demonstrating its priority attached to data management and the utilization of the relatively new data base technology to address the issue. Utilities are interesting in that they rate software development relatively low but place emphasis on the integration and centralization issues. A possible explanation may be that this industry is more involved with end user computing and information centres which reduces the need for software development.

Position - Table 17 summarizes the tests made on respondent position.
<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>Alternative Hypothesis</th>
<th>Issue</th>
<th>p-value</th>
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<td>Top Mgmt = Other Position</td>
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<td>Software Development</td>
<td>.47</td>
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<td>Top Mgmt &gt; 1st Line Mgmt</td>
<td>Planning</td>
<td>.25</td>
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<td>Top Mgmt = 1st Line Mgmt</td>
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**Ex Post Results**

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<th>p-value</th>
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<td>Planning</td>
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<td>Top Mgmt = 1st Line Developers</td>
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<td>Top Mgmt = 1st Line Mgmt</td>
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<td>Systems Payoff</td>
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</tr>
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<td>Top Mgmt = 1st Line Mgmt</td>
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<td>Productivity</td>
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<tr>
<td>Middle Mgmt = System Developers</td>
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<td>Organizational Impact</td>
<td>.006</td>
</tr>
</tbody>
</table>

Table 17. STATISTICAL TESTS ON POSITION

The first two hypothesis test top management against the average of all other positions combined for the technical/application issues of integration and software development. Neither p-value (wrong sign and .47) causes the rejection of the null hypothesis, HoP3 and HoP4, so we conclude that there is no difference between top management and others on these issues.

The next two hypothesis test whether top management rates the strategic issues
of planning and competitive advantage higher than 1st line management. With planning the p-value is .25 which is not unlikely enough to reject the null hypothesis $H_{0P1}$ so we conclude that there is no difference between these two position classes. For competitive advantage, the p-value is .07 suggesting that the hypothesis $H_{0P2}$ be rejected, although somewhat weakly. The alternate hypothesis, $H_{aP2}$, is accepted with the conclusion that there is a significant difference between top and 1st line management on the competitive advantage issue.

The exploratory part of the analysis discovered seven issues where there were significant differences for position. Because six of these involve top management, it is possible to obtain an insight into some of the main concerns of this group. They view the productivity issues significantly higher than 1st line management indicating that it is primarily their role to ensure that system payoffs are realized. Somewhat more surprisingly, top management rates quality assurance and integration higher than 1st line management. This supports the previous speculation that top management may be getting more directly involved with the technical/application issues, especially the critical areas such as integration and quality assurance. The remaining two issues where significant differences were found include planning and office automation, both of which top management rated higher than system developers.

Innovator Category - Table 18 presents the results of the hypothesis tested for adopter category.

The hypothesis, $H_{0A1}$ was not supported in that late adopters do not see end
ANALYSIS AND RESULTS / 79

<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>Alternative Hypothesis</th>
<th>Issue</th>
<th>p-value</th>
</tr>
</thead>
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<td>Late Adopters = Early</td>
<td>Late Adopters &gt; Early</td>
<td>End User Computing</td>
<td>.47</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>wrong sign</td>
</tr>
<tr>
<td>Late Adopters = Early</td>
<td>Early Adopters &gt; Late</td>
<td>Planning</td>
<td>.1</td>
</tr>
<tr>
<td>Late Adopters = Early</td>
<td>Early Adopters &gt; Late</td>
<td>Competitive Advantage</td>
<td>.17</td>
</tr>
</tbody>
</table>

Ex Post Results

| Late Adopters = Early | Early Adopters > Late | Data Security | .03 |
| Late Adopters = Early | Early Adopters > Late | Telecommunications | .03 |
| Late Adopters = Early | Early Adopters > Late | Decision Support Systems | .04 |
| Late Adopters = Early | Early Adopters > Late | Expert Systems      | .0001  |

Table 18. STATISTICAL TESTS ON INNOVATOR

user computing as a bigger issue than early adopters. In fact, the early adopters rated this issue higher (although not significantly). This implies that the end user computing issue will be with us for some time yet as it evolves in most organizations. For the hypothesis HoA2, early adopters do rate planning significantly higher (p < .1), although weakly, than late adopters so we reject HoA2 and accept the alternative HaA2. This suggests, then, that emphasis on planning may be a characteristic of early adopters. For the hypothesis HoA3, the p-value of .17 causes us to accept the null hypothesis that there is no significant difference between early and late adopters for the competitive advantage issue.

The exploratory analysis of adopter category found early adopters significantly
higher than late adopters on four issues. Each of these is either technical or application oriented and may be issues which receive greater attention in the years ahead. Data security and telecommunications have already been found to be important in this research while many academics propose that expert systems hold potential in the future. Decision support systems have been around for several years. Like end user computing, it appears that early adopters see upcoming potential in this area that the late adopters do not.

5.4.5. Emerging Issues

The 29 issues presented on the questionnaire covered the main MIS problems, threats and opportunities. In reading through the unaided comments from Section 2, it became apparent that certain aspects of the issues were not appropriately emphasized. In some cases, a new issue could have been included.

Migrating from old to new applications was frequently mentioned. Although tied to software development, this issue is more specific and can be expected to increase in importance as companies improve their systems from batch to on-line and through the adoption of databases.

Related to migrating applications is migrating technologies. Although similar to organizational learning, this issue goes further by seeking to take advantage of technology advances with their implementation in the organization. With the number of new technologies increasing each year, it can be expected that this issue will increase in importance.
The performance of systems and their capability of satisfying user needs was emphasized by many respondents. This issue could be split apart from quality assurance which could remain as the issue for ensuring that standards such as documentation for application software are enforced.

When to obtain outside services is an issue not adequately covered by any of the 29 on the survey. With technology advances comes greater expertise requirements. Some organizations will turn to outside consultants and vendors increasingly for services which they cannot themselves provide.

Clearing the backlog, although it has been an issue for many years, was not specified in the descriptions. The applications portfolio issue should be expanded with this point.

The two issues included from Sprague and McNurlin (1986), systems payoff and organizational impact, have a high degree of importance. These two issues places 16th and 19th respectively as the most important issues perceived by all respondents to the survey.

Finally, relational databases has increased substantially in importance relative to Branchecau and Wetherbe (1987). Shown to be insignificant by that study, this issue has risen to 14th most important as perceived by all respondents.
CHAPTER 6. DISCUSSION

6.1. THE MAIN CONCLUSIONS

Following the structure used in the previous sections of this paper, conclusions may be divided into those related to the methodology used and those related to the issues themselves. For methodology, this research has found that there is not much difference between using a numerical rating scale or a ranking technique. In other words, either method gives similar results. A bigger difference was found when issues were stated as descriptions versus normative statements, although statistically there was still a significant relationship between these two methods.

For the issues themselves, it is important to realize that they do not exist in isolation but rather interact with one another. For example, the key to telecommunications may be through more effective planning. Data management seemed to be the predominant issue, placing first when all respondents were aggregated and second when just senior managers were included. Data management was also perceived as the basic theme in a number of other issues such as end user computing, integration and planning. For instance, end user computing was described by some as having users get easier access to data.

The strategic grid framework was not supported by this research. Information intensive industries such as those in the financial sector do not rate strategic issues such as planning and competitive advantage significantly different than
manufacturing firms. Also, manufacturing does not consider software development and support to be more important than does the financial sector.

Interestingly, the greatest variations were found in the relationship between industry and the importance of issues. Of the four demographic variables examined, there were far more significant differences found along the industry variable than the other three, although this is partially due to more statistical tests on industry. Respondent position had the second greatest impact followed by adopter category and company size.

There appears to be some underlying core issues to the 29 specific issues used in this study. The exploratory factor analysis resulted in the five groups of data management, end user computing, strategic issues, integration and productivity and people. There does not appear to be any respondent pattern that varies according to management/enterprise versus technical/application issues.

6.2. FUTURE DIRECTIONS

Just as this research built on previous studies, it is hoped that future studies may use some insights gained from this work. Given that the systems profession is changing rapidly, it is important to carefully consider any emerging issues. These can be incorporated either through enhancing existing issue definitions or through the addition of a new issue. Migration of new to old applications is but one example which was identified in the emerging issues section of this paper.
Care should be taken when defining the issues. It appears that strategic issues, when presented as normative statements, produce a halo effect because they sound very important. A multi-method approach, such as the one used in this research, may address this bias.

The survey population should be closely scrutinized. There are significant differences along the industry, position, adopter category and size variables and these should be taken into account when explaining any results. It could also be that the importance of issues will differ by some variables in addition to these.

The factor analysis from this study could be extended from the exploratory stage to the confirmation stage. This would involve a revised instrument, perhaps with global issues presented along with the specific issues.

Finally, future studies might consider the possibility of examining the issues to find out what practitioners are going to do to address them. We now have a good perspective of the MIS issues. Let's now obtain ideas about how to best deal with them.

2. Ball, L. and Harris, R., "SMIS Members: A Membership Analysis", *MIS Quarterly*, March 1982


7. Hartog, C., Herbert, M., (B) "MIS Rates the Issues", *Datamation*, November 15, 1986


Section 1 Background

The following information is needed to help us with the statistical analysis of the data. This information will allow comparisons among different types of companies and positions within MIS.

1. Which of the following best describes your company's major business:

   - MANUFACTURER OF COMPUTER
   - EQUIPMENT
   - OTHER MANUFACTURING
   - EDUCATIONAL
   - FINANCE: BANKING, INSURANCE, ETC.
   - TRANSPORTATION
   - GOVERNMENT
   - RETAIL TRADE
   - WHOLESALE TRADE
   - UTILITY
   - CONSULTING
   - OTHER (PLEASE SPECIFY)

2. Approximately what were the total gross sales in 1986 (or budget if non-profit organization) for your entire company? (Please include all divisions and branches anywhere in the world.) $

3. Approximately how many data processing professionals are there in your organization?

   - IN THE DP DEPARTMENT?
   - IN ALL CLIENT/USER DEPARTMENTS?

4. Which of the following categories best describes your organization's degree of innovativeness in its adoption and use of information technology as compared to other organizations in your industry:

   - INNOVATOR: usually first to adopt
   - EARLY ADOPTOR: far ahead of average
   - EARLY MAJORITY: just before average
   - LATE MAJORITY: just after average
   - LAGGARD: among the last to adopt

5. In which of the following categories would you place your current position:

   - TOP MGMT - REPORT OUTSIDE IS
   - MIDDLE MIS/DP MGMT
   - FIRST LINE MIS/DP MGMT
   - CONSULTANT
   - INSTRUCTOR
   - SYSTEMS ENGINEER
   - STUDENT
   - PROGRAMMER/ANALYST
   - COMPUTER SALES
   - DATA BASE ADMIN
   - OTHER (PLEASE SPECIFY)

6. What is your present job title?

7. What is the title of the person to whom you report?
Section 2 - Your Three Key Issues

Please list what you feel are the three most important MIS issues (in order) facing your organization in the next 2-3 years along with a brief description. We define issue as an opportunity, threat, or problem associated with the effective use of computer technology within your organization. Importance should be interpreted as the amount of effort or resources you plan to utilize in addressing this issue over the next 2-3 years.

Note for consultants: - For this and subsequent sections, please respond based on what you feel your clients view as most important.

1. 

2. 

3. 

Respondents are requested not to look ahead to the remaining sections of this questionnaire before completing this section.
Section 3 - Your Rating of Information Systems Activities

While the activities listed below were found to be significant in previous research, we are interested in determining their degree of importance for your organization. For each activity, rate how important you feel it is for your organization to improve its effectiveness over the next 2-3 years by circling the appropriate number.

Example: If you feel that the activity of Software Development is one in which your organization will allocate substantial resources over the next 2-3 years in order to improve its effectiveness, you would circle 7. If you feel that there are no problems with the way in which you develop software and plan no changes over the next 2-3 years, you would circle 1.

Please rate the importance based on the amount of resources your organization plans to utilize in improving effectiveness over the next 2-3 years.

Data Security
Ensuring that data is not inappropriately altered, destroyed or disclosed to unauthorized persons.

Organizational Location of MIS
Locating MIS appropriately within the organization to effectively support corporate business goals.

End User Computing
The use of computing technologies by non-DP professionals.

Quality Assurance
Developing and enforcing standards for the quality of application software.

Software Development
Analyzing, constructing and implementing software programs for the organization.

Integration of Technologies
Integrating data processing, telecommunications, office automation and other technologies.

Planning
Developing IS plans to support the organization's strategies.

Educating Senior Personnel
Educating senior corporate personnel to better understand MIS, its role, and the contribution MIS can make to the organization.
Please rate the importance based on the amount of resources your organization plans to utilize in improving effectiveness over the next 2-3 years.

Telecommunications Technology
Managing telecommunications such as computer networks and data, voice and video communications.

Data Management
Managing data so that it can be accessed and utilized appropriately.

Measuring Productivity
Measuring DP productivity and evaluating the benefits of the DP function.

Recruiting and Training
Recruiting and training of DP skills for personnel within the organization.

Decision Support Systems
Developing and implementing systems to support managerial decision making.

Fourth Generation Languages
Assessing, adopting and utilizing appropriate fourth generation languages and other productivity tools.

Information Centres
Managing the personnel and facilities needed to support end user computing.

Centralization/Decentralization of Services
Structuring of MIS services into those that are offered centrally and those that are distributed or decentralized.

Expert Systems and Artificial Intelligence
Investigation of potential AI and expert system applications.

Office Automation
Planning, implementing, and managing office automation.

External Data
Managing the use of data that originates outside the organization.

Information Architecture
Identifying the major corporate/global information categories within an enterprise and their relationships to business processes.
Please rate the importance based on the amount of resources your organization plans to utilize in improving effectiveness over the next 2-3 years.

Applications Portfolio
Managing the mix of application systems in use and under development, so as to achieve an appropriate portfolio of systems.

Packaged Software
Managing the acquisition, implementation and maintenance of packaged application software for the organization.

Systems Payoff
Taking steps to ensure that the return from IS expenditures is calculated and understood.

Productivity
Taking steps to improve MIS productivity.

Factory Automation
Planning and implementing new factory-related technologies such as computer-aided design, manufacturing, robotics and materials requirement planning.

Organizational Impact
Understanding and managing the impact of system implementations on the organization and on the individuals within the organization.

Competitive Advantage
Identifying and capitalizing on opportunities to use information systems to gain competitive advantage for the organization.

Relational Databases
Understanding and managing the implementation of relational databases.

Organizational Learning
Facilitating the learning about IS technology and its use within the organization.

Please describe any activities which you feel are not captured by the above and assign a rating for each.
Section 4 - Your Ranking of Information Systems Activities

Please consider again the 29 activities which you have just evaluated. As listed below in abbreviated format, rank your top 10 activities by attaching a 1 to the most important, 2 to the second most important and so on to your 10th choice. Activities not included on the list which you feel are important can be written in at the bottom and ranked. Feel free to reference the more detailed descriptions on the preceding pages.

Example: If you feel that the activity of Software Development is the third most important based on the resources you plan to utilize over the next 2-3 years to improve its effectiveness, write in a 3. If you feel that it is the 11th, 12th, etc. most important, you would leave Software Development blank.

<table>
<thead>
<tr>
<th>Data Security</th>
<th>RANK</th>
<th>Expert Systems and AI</th>
<th>RANK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organizational Location of MIS</td>
<td></td>
<td>Office Automation</td>
<td></td>
</tr>
<tr>
<td>End User Computing</td>
<td></td>
<td>External Data</td>
<td></td>
</tr>
<tr>
<td>Quality Assurance</td>
<td></td>
<td>Information Architecture</td>
<td></td>
</tr>
<tr>
<td>Software Development</td>
<td></td>
<td>Applications Portfolio</td>
<td></td>
</tr>
<tr>
<td>Integration of Technologies</td>
<td></td>
<td>Packaged Software</td>
<td></td>
</tr>
<tr>
<td>Planning</td>
<td></td>
<td>Systems Payoff</td>
<td></td>
</tr>
<tr>
<td>Educating Senior Personnel</td>
<td></td>
<td>Productivity</td>
<td></td>
</tr>
<tr>
<td>Telecommunications Technology</td>
<td></td>
<td>Factory Automation</td>
<td></td>
</tr>
<tr>
<td>Data Management</td>
<td></td>
<td>Organizational Impact</td>
<td></td>
</tr>
<tr>
<td>Measuring Productivity</td>
<td></td>
<td>Competitive Advantage</td>
<td></td>
</tr>
<tr>
<td>Recruiting and Training</td>
<td></td>
<td>Relational Databases</td>
<td></td>
</tr>
<tr>
<td>Decision Support Systems</td>
<td></td>
<td>Organizational Learning</td>
<td></td>
</tr>
<tr>
<td>Fourth Generation Languages</td>
<td></td>
<td>Others:</td>
<td></td>
</tr>
<tr>
<td>Information Centres</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Centralization/Decentralization of Services</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Section 5 - Your Rating of Issue Statements

The issue statements below are similar to previous sections; however, in this instance we are not interested in the amount of resources you plan to utilize in addressing them. Rather, we want your opinion as to your level of agreement as they pertain to your organization. Again, issue is defined as an opportunity, threat, or problem associated with the effective use of technology within your organization. Please interpret MIS as the MIS department in your organization.

Please rate your level of agreement as they pertain to your organization.

<table>
<thead>
<tr>
<th>Issue Statement</th>
<th>Strongly Disagree</th>
<th>Neither Agree/Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methods of measuring DP productivity and evaluating benefits to the user need to be improved.</td>
<td>1 : 2 : 3 : 4 : 5 : 6 : 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MIS must consider the implementation of relational database systems given the increasing demand for uncomplicated access to large volumes of data and the technical feasibility of relational systems.</td>
<td>1 : 2 : 3 : 4 : 5 : 6 : 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MIS must ensure that data is not altered, destroyed or disclosed to unauthorized persons.</td>
<td>1 : 2 : 3 : 4 : 5 : 6 : 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continued shortages of trained personnel within the organization will increase the importance of recruiting and retraining personnel.</td>
<td>1 : 2 : 3 : 4 : 5 : 6 : 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MIS must become a source of strategic new business opportunities in order to give the business a competitive advantage in addition to pursuing its traditional role.</td>
<td>1 : 2 : 3 : 4 : 5 : 6 : 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The applications portfolio must be managed more effectively due to its size, complexity and maintenance cost.</td>
<td>1 : 2 : 3 : 4 : 5 : 6 : 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packaged application software must be better managed in order to cut costs and boost productivity while at the same time satisfying integration and maintenance requirements.</td>
<td>1 : 2 : 3 : 4 : 5 : 6 : 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MIS must better integrate data processing, telecommunications, and office automation technologies.</td>
<td>1 : 2 : 3 : 4 : 5 : 6 : 7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Please rate your level of agreement as they pertain to your organization.

MIS must implement a plan that determines which services to offer centrally and which to decentralize or to distribute.

* * * * *

Important telecommunications decisions must be made despite rapid and major technological changes.

* * * * *

MIS must determine to what extent and how fourth generation languages and other productivity tools should replace existing technologies.

* * * * *

MIS must facilitate learning of technology potential so that appropriate use of IS technology can be made within the entire organization.

* * * * *

Planning for new technologies such as computer-aided design, manufacturing, robotics and materials requirement planning should be vigorously pursued since complex factory systems will need to be integrated with corporate information systems.

* * * * *

Better quality assurance standards must govern software development, maintenance, and production procedures.

* * * * *

Packaged application software must be better managed in order to cut costs and boost productivity while at the same time satisfying integration and maintenance requirements.

* * * * *

MIS productivity must be improved because of increased personnel costs, the pressure of the backlog, and growing corporate impatience with MIS.

* * * * *

MIS must be positioned appropriately within the organization to effectively support corporate business goals.

* * * * *

Software needs to be developed more efficiently to reduce the backlog and improve user satisfaction.

* * * * *

MIS must better ensure that IS investments are justified. All system development, equipment and implementation costs need to be included.
Please rate your level of agreement as they pertain to your organization.

MIS must closely align the long range IS plan with the strategic business plan due to rapidly changing technology and business environments.

* * * * *
Data must be managed so that information is accessible and utilized to its full potential.

* * * * *
A corporate/global information architecture is needed to identify the major information categories within an enterprise and their relationships to business processes.

* * * * *
Senior corporate personnel need to better understand MIS's role and the contribution it can make to the enterprise.

* * * * *
There is a need for better MIS policy and methodology in developing systems to support managerial decision making.

* * * * *
MIS should improve information centre resources to better promote and facilitate end user computing.

* * * * *
MIS must determine the potential for AI and expert systems in order to plan implementations over the next few years.

* * * * *
MIS must take a leadership role in planning, implementing, and managing office automation.

* * * * *
MIS must heighten user awareness of data originating outside the organization and its potential uses.

* * * * *
There is a need for better MIS policy guidelines and support of end user computing while still maintaining the integrity of the MIS operation.

* * * * *
As increasingly large and important systems are implemented, the effect on the organization, especially people, needs to be better planned.
Thank-you for taking the time to provide us with this information. The results of this survey will be presented at upcoming CIPS and DPMA meetings.

In the near future we will be extending this research by conducting a number of brief interviews with selected respondents. If you would like to be included in this study please attach your business card (or equivalent) to this questionnaire. A researcher will contact you to further explain this aspect of the study and to set up a convenient time for the interview.

* * * * *
Survey of Key MIS Issues – An Update

The survey, which you received in early December, has received 110 responses or about 20 per cent returned in the first week. Although we are encouraged by the response thus far, we urge those who haven't yet returned the survey to kindly take the 20 minutes or so to complete it, even though it's after the requested completion date of December 10th. Your reply will greatly improve the quality of the results which will be thoroughly analyzed in the New Year and communicated to CIPS in the spring.
APPENDIX 6 - CALCULATION OF W

KENDALL'S COEFFICIENT OF CONCORDANCE W

"As a solution to the problem of ascertaining the over-all agreement among k sets of rankings, it might seem reasonable to find the $r'_s$ (or r's) between all possible pairs of the rankings and then compute the average of these coefficients to determine the over-all association. In following such a procedure, we would need to compute $\binom{k}{2}$ rank correlation coefficients. Unless k were very small, such a procedure would be extremely tedious.

The computation of $W$ is much simpler, and $W$ bears a linear relation to the average $r'_s$ taken over all groups. If we denote the average value of the Spearman rank correlation coefficients between the $\binom{k}{2}$ possible pairs of rankings as $r'_s$, then it has been shown (Kendall, 1948a, p. 81) that

$$r'_s = \frac{kW - 1}{k - 1}.$$  

For the calculation of pg. 55

$$r'_s = \frac{1.68}{3} = .56$$

$$\frac{k*(w) - 1}{k-1} = .56$$

$$k = 3$$

$$3w = 1.12 + 1$$

$$w = .7066$$

$$x^2 = \frac{K(N-1)}{W}$$

$$N = 29$$

$$K = 3$$

$$x^2 = 3 \cdot 28 \cdot .71 = 59.6$$

$$d.f. = N-1 = 28$$

$$p < .001$$