Key Issues in Management of Information Systems in the Australian Environment.

by

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Declaration

To the best of my knowledge and belief, the work presented in this thesis is original, except as acknowledged in the text. All sources used in this research have been cited, and no attempt has been made to present the contributions of other authors as my own. The material has not been submitted, either in whole or in part, for a degree at this or any other institution.

Syed Arshad Usman

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Abstract

Key Issues in the Management of Information Systems in
the Australian Environment
(Under the direction of Andrew Stein)

This research is an exploratory study of key Information Systems (IS) issues in the management of information systems in the Australian business environment. Many information systems managers face a difficult task because they operate in the nexus between information technology and senior management. IS managers must be able to interpret trends in information technology, assess their impact on the organisation and decide which technologies to adopt. This process is becoming even more crucial as communications and information technologies are merging. Deciding on the proportion of resources allocated to business, technical, human resources, systems development or managerial problems is an important facet of the IS manager's job. Only by studying key IS issues in the management of information systems are IS professionals able to analyse the impact of these issues on the skills and knowledge requirements within organisations. Knowledge of these issues will help IS professionals in the future development of information systems.

This study sampled 450 organisations from the states of Victoria, New South Wales and Queensland. Organisations with number of employees greater than 500 were used and a useable survey of 76 replies formed the basis for analysis. The key IS issues that made up the research instrument were compiled by analysing and conglomerating previous key issues surveys. It is apparent from the comparison findings that the key IS issues are fluid in nature and great care needs to be taken in developing lists of issues.

Four research questions formed the basis of this study. The main aim and the first research question was to identify key IS issues in the management of information systems in the Australian business environment. The issues were grouped into three

categories, unanimous agreement, probable agreement and ambivalent. Main findings for this question showed that two business issues, IS Strategic Planning and IS for Competition ranked top. The human resource issues, Education for IS Staff and Human Resources for IS, were in the bottom group of issues. The rating of the issues showed that the IS professional needs a mixture of business, human resources, technical and systems development knowledge.

The second research question compared the key IS issues identified in this study with previous Australian and international studies. The main finding in the Australian comparison showed that most issues stayed the same or increased in importance with previous surveys. The only issue that decreased in importance was Software Development. The comparison with international surveys was beset with the problem of comparing issues. The main finding here showed the difficulty in comparing findings in surveys that have constantly changing issue lists.

The third research question identified any emerging trends in information systems. Four new trends highlighted by the IS respondents were: managing Information Technology (IT) cost, the year 2000 problem, aligning IT to business now and in the future, and IS customer service considerations.

The fourth research question explored any effect that industry group, IS department size or IS respondent level had on the perception of key IS issues. Most of the key IS issues were not affected by the respondents' industry group, department size or IS level. The only issues that showed significant differences were Software Development for the mining & petroleum industry group and Executive Support Systems (ESS) & Decision Support Systems (DSS) for medium sized IS departments. The other major finding showed that no differences existed for IS respondent levels.

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1. Introduction

1.1 Introduction

Information is one of the assets that an organisation possesses. Information must be well managed like other assets and resources if the organisation is to be effective. Information, if badly managed, can lead to operational and managerial ineffectiveness and even to complete failure (Avision et al 1996).

The arrival of information technologies (IT) has made it possible to obtain new benefits from business processes in using information more efficiently and comprehensively. Information systems (IS) for gathering, storing and processing information are an integral part of every organisation's processes. The arrival of technologies which are capable of changing, enhancing or eliminating business processes, has made the management of information systems a subject needing specific attention. Few professions have seen as rapid a change over the past several decades as the field of information systems and services. Information systems today not only provide the backbone of information processing for organisations, they are also fundamentally changing the way organisations operate (Hammer et al 1990).

Changes in information technologies and changing patterns of use create different demands on the jobs of IS professionals and new expectations in the roles of IS professionals within organisations (Liebenau et al 1990). It is important for IS professionals to be aware of the key issues of information systems management so that they can serve the business community effectively.

1.2 Thesis Scope

According to McLean et al (1996) "*The term IT is used interchangeably with IS*". IT in its narrowest definition, refers to the technological side of an information system and as a broader concept refers to the collection of the entire systems in an

organisation (Deans et al 1992). IS is a physical process that supports an object system by providing information to achieve organisational goals (McLean et al 1996). In this research information systems will be considered a CBIS (Computer based Information system) and the term IT is used in its broadest sense.

This research is primarily a replication study to ascertain the current issues and trends in the information systems environment in Australia. A number of studies exploring the key issues in the management of information systems have been performed by other researchers: United Kingdom-Galliers, Merali & Spearing (1993); European-CSC (1993); United States-Niederman, Brancheau & Wetherbe (1991); United States-Lee, Trauth & Farwell (1995); Canada-Pollard & Hayne (1996); South Korea-Kim & Kim (1995); Hong Kong-Burn, Saxena & Cheung (1993); United States- Brancheau, Wetherbe, Janz (1994-1995) and in Australia-Pervan (1993, 1996). This thesis explores the existing studies and use these to provide a grouping of IT issues. This research compares the trends in key issues in information systems management from previous Australian and international studies. The effect of new developments in information technology on information systems issues is also presented. The research will also explore the possible impact that industry type, size of IS department and level of IS personnel may have upon the key IS issues.

The survey technique is proposed and limitations imposed by time and financial constraints will limit the survey to large organisations (employee greater than 500) and to three states, Victoria, New South Wales and Queensland.

1.3 Thesis Rational

The principal reason for undertaking this research is to identify the key issues in the management of information systems in the Australian business environment. The results of the research will be of interest to IS educators, consultants, professional societies, and researchers that serve the IS community. Educators need information on key concerns so that they may develop graduates with the necessary skills to solve these issues. Consultants, who play a key role in IS because they can

accelerate the transfer of new skills and technology to IS practitioners, can be more effective if they know the areas in which their clients need the most assistance. Professional societies serve the IS community by arranging conferences, sponsoring guest lectures, and disseminating information through their publications. Successful performance of these tasks requires that professional societies are in tune with the needs of their members. Researchers will be more successful in attracting sponsorship if they undertake studies that are closely aligned to the concerns of the market place. Therefore, it is important that the Australian IS community is aware of those issues that are judged by its leading practitioners to be of critical concern.

The major research objective is to ascertain the key issues in the management of information systems in the Australian business environment, and how these issues compare with previous international and Australian studies. A further objective is to ascertain emerging trends in information systems and the possible effect that IS respondent level, IS department size and industry groups have on key IS issues.

To achieve the above objectives the following key research questions are proposed:-

RQ1: *What are the key issues in information systems management in the Australian business environment?*
RQ2: *How do these key issues compare with international and previous Australian studies?*
RQ3: *Are there any emerging information systems issues?*
RQ4*: Does industry group, IS respondent level or IS department size effect the perception of key IS issues?*

1.3 Description of Chapters

This thesis contains five chapters: Introduction; Information Systems Management Issues; Research Methodology; Data Analysis and Findings and Interpretation of the Results with Conclusion.

1.3.1 Information Systems Management Issues

Chapter Two provides a review which summarises the relevant literature and presents a thematic study of information systems and its management, the trends in information systems technology and a description of the issues in managing information systems.

1.3.2 Research Methodology

In the research methodology chapter, the research questions that form the basis for study are presented along with the research instrument with justification and the sampling and surveying methodology.

1.3.3 Data Analysis and Findings

Chapter Four presents the data analysis together with a discussion of findings. Data analysis discusses survey demographics with a discussion of the data gathered by the survey instrument. The finding section presents a thorough analysis of the data.

1.3.4 Interpretation of the Results

The interpretations and conclusions presented in chapter five explore the significant outcomes of the findings and any implications for future research.

2. Information Systems Management Issues

Synopsis

This chapter reviews the literature relating to development of issues of information systems. The evolution of information systems is described in detail and the functions and characteristics of information systems are also presented. The effect of information systems on business is also explained. Key issues from previous studies are collected and categorised and then conglomerated to form a "*super set*" of key IS issues. These issues becomes the basis of the study. The chapter is concluded by providing a detailed description of the "*super set*" of issues.

2.1 Key Definitions

Information and Data:- *"Data represents unstructured facts"* (Ahituv et al 1994). Another definition of data is that "*Data is the raw material which goes into a process to produce information"* (Fitzgerald et al 1995). Buckingham (1987) defines information as *"explicit knowledge"*. In other words, information expresses what is meant clearly, with nothing left implied. Another definition of information is that *"Information is what people require so that they can use their experience and skills to convert to knowledge"* (Fitzgerald et al 1995).

Information Systems:- An information system assembles, stores, processes and delivers information relevant to an organisation (or society), in such a way that the information is accessible and useful to those who wish to use it including managers, staff, clients and citizens. An information system is a human activity (social) system which may or may not involve the use of computer systems (Buckingham et al 1987).

2.2 Information Systems: A Changing Scenario

Few technologies in human history have advanced as rapidly as computing technology has in the last several decades. Advances in areas such as the evolution of programming languages from one generation to the next, new developments in methodologies and tools have changed the way we manage the software development process. The capabilities of computer systems have been drastically improved by the introduction of artificial intelligence, expert systems, neural network computing, massively parallel processors, and networking and telecommunication technologies. IS professionals as experts are expected to stay abreast of these developments and to provide assessment and advice to users (Port et al 1994).

The challenges faced by IS professionals go beyond the implementation of information technology. As the business environment changes and becomes increasingly competitive, IS professionals are faced with new challenges. These include pressure for resource allocation, searching for more cost-effective ways to apply computer technologies to solve business problems, and demonstration to upper management that investment in information technology will be good for the future of the company (Farwell et al 1992).

Advancement in technologies and changes in the business environment has led to fundamental changes in the role of the traditional IS function in organisations. According to Farwell et al (1992) and supported by Pitt et al (1995), the traditional role of the central IS organisation as the sole proprietor of information technologies has been challenged and changed from being primarily developers of IS to being information systems service providers. Keen (1988) suggested that IS departments must change from "*task oriented*" to "*role oriented*" in order to function effectively in the new business environment. The "task oriented" approach reinforces an IS culture of narrow technical orientation and stubbornness, leading to the perception by the user community that IS is "*unresponsive*". Keen (1988) argues that future IS

activities should be examined from a "*role*" perspective, which emphasises the relationship between IS and users. Farwell et al (1992) proposes that the IS function must make a radical shift from being the proprietor of information systems and products to being a service provider to end-users. These changes all have potential to impact upon IS educators with curriculum development and IS professional bodies with accreditation requirements.

2.3 Evolution of Information Systems

Early electronic computers were designed to compute formulas for scientific and military applications. Automated Data Processing (ADP) was the first major application of computers in management. The aim of automated data processing was to process large amounts of data quickly, cheaply and accurately.

As the cost of computers decreased and computing capability increased, it became possible to justify IS for tasks of less repetitive volumes. A new breed of IS started to develop. These systems accessed, organised, summarised, and displayed decision-relevant information in the functional areas, such systems were called Management Information Systems (MIS). MIS grew naturally out of the earlier simple data processing system. They are characterised mainly by their ability to produce periodic reports such as a daily list of employees and the hours they work, and weekly report of sales by product, or a monthly report of expenses as compared to a budget. MIS are also used to forecast trends and to support routine decisions. According to Angell et al (1991), "*MIS usually means a system which contains large amounts of information which has been structured to assist management in decision making*". Typically, the information is held on some form of database, consisting mainly of financial data from internal company systems, and is used mainly by middle management in monitoring and controlling the organisation's business. Management information systems are essentially historic, being concerned with past actions and outcomes.

The increased capabilities and reduced costs justified computerised support for an increasing number of nonroutine applications known as Decision Support Systems

(DSS). These systems were also created as a response to some of the perceived failings of MIS (Moyniham 1993). The MIS, because it was based mainly on internal financial data, did not directly address the needs of top management, or of strategic decision makers. A DSS usually contains specially designed models (Turban 1990) which provide the user with the means of assessing the consequences of a decision.

A new computing discipline emerged called Artificial Intelligence (AI). This included the capacity of computers to reproduce human like skills and abilities. In recent years this has been supplemented by substantial commercial development, particularly in expert systems (Ahituv et al 1994). A number of special techniques have been developed over the years which enable computers to go some way towards emulating these skills. It is now possible to store the knowledge of human experts in a computer and to enable the knowledge to be tapped. An enquirer consults the system, reviews the problem, asks questions if necessary and provides a diagnosis and suggests ideas for a solution. Extending the computer's capabilities to process knowledge became possible only when the power of computers and their storage capabilities reached a high enough level. Similarly, providing extensive capabilities at a reasonable cost resulted in the development of additional systems, eg., Executive Information System (EIS) (Rockart et al 1988) that provide information to executives and Group Support Systems (GSS) that provide support to people working in groups (McLean et al 1996).

The reduced cost of computers has enormously increased their use in the past decade, which has lead to the emergence and popularity of new information systems technologies, namely networking, internets, intranets, extranets and multimedia. According to Freund (1990) networks are defined as connecting systems that permit the sharing of resources by different computers. Computer networking offers the potential to provide a single window to the enterprise for executives and their line management.

The internet is defined as a "*network of networks*" or as a " *loose collection of related computer networks*" (Cats-Baril et al 1997). Initially this system was used by defence department and academic researchers, and has evolved into a mass communication media that may significantly change the way many organisations conduct business today (Cats-Baril et al 1997). The word multimedia refers to the integration of multiple media such as visual imagery, text, video, sound and animation. The integration of multimedia technology into the communication environment has the potential to be a powerful tool that can greatly enhance communication (Villamil-Casanova et al 1996).

2.4 Characteristics of an Effective IS

Wilhelm (1987) listed four common requirements of an effective IS. They are:

- The role and the responsibility of the information system must be defined;
- Basic parameters affecting information systems development and implementation success can be formidable, they must be identified, weighed, and respected. Three are risk aversion, flexibility, and stage of technological maturity;
- The IS group must receive proper guidance from top management;
- The IS must work to accomplish an approved plan that includes controls to measure performance.

2.5 Five Basic Functions of IS

Information services (or system) groups, however organised or named, accomplish five functions or activities (O'Brien 1985). They are:

- **System development**: system development includes investigation, analysis, design, programming, implementation, and system maintenance; O'Brien adds configuration management and communications management;
- **User service**: Provides services to users through an information center that assures they receive hardware support, software support, and people support (that is, a staff of system analysts and programmers especially trained to help users);

- **Data administration**: Coordinated and controlled by a database administrator (DBA) or a database administrator department. Database administration comprises database design, database operations, and database security;
- **Operations**: The operations function, that is, the processing of data and its conversion of information. Covers the major activities of data and preparation and control, equipment operation, production control, and production support;
- **Administration**: Administration of IS, like the administration of any other function, includes planning, controlling, managerial liaison, personnel management, financial management, and routine services such as supply and custodial services.

2.6 IS and the Changing Business Environment

The business environments that surround organisations are increasingly becoming more complex and turbulent (Scott-Morton 1991). Advances in communication, transportation, and technology create many changes. Organisations must take actions aimed at improving their operations in such a volatile business environment. These actions may include better scanning of the environment, improved forecasting, flexible and adaptable planning, re-engineering of business process, building business alliances, and creative decision making. Information systems can be viewed as an enabler or supporter of such actions and investing in them gives firms a competitive advantage in the market place through increased coordination and control of its activities (McLean et al 1996).

The globalisation of the business environment is an important consequence of the advancement of information technology (Worthington 1997). Rapid and inexpensive communication and transportation increases the magnitude of international trade even further. Global information systems applications collapse time and distance to enable corporations to conduct business twenty-four hours a day while almost completely eliminating information float (the time between the creation of the information and its use). The use of IT to improve productivity, quality, and profitability is the best approach to deal with many of the problems and opportunities of globalisation (Ives et al 1991). The assessment of new information

systems thus includes the consideration of radical change to business processes as well as technologies. This implies that it is no longer adequate for IS professionals who are responsible for design and implementation to be competent only in technology, they must also have an in-depth understanding of business functions and needs (Maglitta 1993).

2.7 Critical IS Issues

Sections 2.2 - 2.6 presented a brief overview of the development of IS and the development of key IS issues and trends over the lifetime of information systems. These key IS issues and trends have been studied by previous researchers and can be shown to be divided into categories. Studies from Pervan (1993), Pervan (1997), Galliers et al (1993), CSC (1993), Niederman et al (1991), Lee et al (1995), Pollard et al (1996), Kim et al (1995), Burn et al (1993) and Brancheau et al (1994-95) have been analysed and have yielded a synthesised "*super set*" of key IS issues.

They are categorised as follows:- (year references have been truncated)

2.7.1 IS Business Issues

1. Improving IS strategic planning. (Pervan 93;97; Galliers et al 93; CSC 93; Niederman et al 91; Pollard et al 96; Kim et al 95; Burn et al 93; Brancheau et al 96; Lee et al 95)
2. Using information system for competitive advantage. (Pervan 93;97; Galliers et al 93; Niederman et al 91; Pollard et al 96; Burn et al 93; Brancheau et al 96; Kim et al 95)
3. Increasing understanding of the role and contribution of IS. (Pervan 93;97; Niederman et al 91; Kim et al 95; Pollard et al 96)
4. Facilitating organisational learning and use of IS technologies. (Pervan 93; Kim et al 95; Brancheau et al 96; Galliers et al 93; Niederman et al 91; Pollard et al 96; Kim et al 95; Pervan 97)
5. Facilitating/ managing executive and decision support system. (Pervan 93; Galliers et al 93; Niederman et al 91; Pervan 97)

6. Measuring IS effectiveness and productivity. (Pervan 93; Galliers et al 93; Niederman et al 91; Pollard et al 96; Kim et al 95; Brancheau et al 96; Pervan 97)
7. Determining appropriate IS funding levels. (Pervan 93;97)
8. Using IS to influence organisational structure. (Pervan 93)
9. Business process redesign. (Galliers et al 93; CSC 93; Pollard et al 96; Kim et al 95; Brancheau et al 96; Pervan 97)
10. Planning for disaster recovery. (Pervan 93;97; Niederman et al 91)
11. Develop in-house applications. (Lee et al 95)
12. Cutting I/S Costs. (CSC 93)
13. Implement new or changed computer-supported business processes. (Lee et al 95)
14. Connecting to customers and suppliers. (CSC 93)
15. Capitalising on advances in IT. (CSC 93)
16. Analyse business problems and IS solutions. (Lee et al 95)
17. Implementing professional certification and IS code. (Pollard et al 96)

2.7.2 IS Technical Issues

1. Building a responsive IT infrastructure. (Pervan 93;97; Niederman et al 91; Pollard et al 96; Kim et al 95; Brancheau et al 96)
2. Aligning the IS organisation with that of the enterprise. (Pervan 93;97; CSC 93; Niederman et al 91; Pollard et al 96; Kim et al 95; Brancheau et al 96)
3. Promoting effective use of the data resource. (Pervan 93; Galliers et al 93; Niederman et al 91; Brancheau et al 96; Pollard et al 96; Kim et al 95; Burn et al 93; Pervan 97)
4. Developing an information architecture. (Pervan 93; Galliers et al 93; CSC 93; Pollard et al 96; Kim et al 95; Brancheau et al 96; Pervan 97; Niederman et al 91)
5. Improving data integrity and quality assurance. (Pervan 93;97)
6. Facilitating and managing end-user computing. (Pervan 93;97; Niederman et al 91; Pollard et al 96; Kim et al 95; Burn et al 93; Lee et al 95; Brancheau et al 96)
7. Enabling Electronic Data Interchange and multi-vendor integration. (Pervan 93; Niederman et al 91; Brancheau et al 96; Pervan 97)
8. Improving security and control. (Pervan 93; Galliers et al 93; Niederman et al 91; Pervan 97)

9. Integrating data processing, office automation, factory automation, and telecommunication. (Pervan 93; Niederman et al 91; Burn et al 93; Pervan 97)
10. Developing and managing distributed systems. (Pervan 93; Niederman et al 91; Pollard et al 96; Kim et al 95; Brancheau et al 96; Pervan 97)
11. Selecting and managing packaged application software. (Pervan 93; Lee et al 95; Burn et al 93; Pervan 97)
12. Integrate networks. (Lee et al 95; Kim et al 95)
13. Integrate data types. (Lee et al 95)
14. Support hardware. (Lee et al 95)
15. Integrate existing & new business applications. (Lee et al 95)
16. Develop data bases. (Lee et al 95)
17. Improving IS project management practices.(Pollard et al 96)
18. Planning and communicating networks. (Pollard et al 96; Kim et al 95; Brancheau et al 96; Pervan 93;97; Niederman et al 91)
19. Copying with Degree and Rate of technology change. (Pollard et al 1996)
20. Planning and integrating Multi-Vendor Open Systems Technology. (Pollard et al 96),(Kim et al 95; CSC 93)
21. Support Information access and security. (Lee et al 95)
22. Developing and managing EDI Interchange. (Pollard et al 96; Kim et al 95; Brancheau et al 96; Pervan 97)
23. Implement and managing collaborative support systems. (Pollard et al 96; Kim et al 95; Brancheau et al 96; Pervan 97)
24. Managing the existing portfolio of legacy applications. (Pollard et al 96; Brancheau et al 96; Pervan 97)
25. Outsourcing selected information service (Kim et al 95; Brancheau et al 96; Pervan 97)
26. Telecommunication technology. (Burn et al 93)
27. Aligning MIS / DP organisation. (Burn et al 93)
28. Integrated systems. (CSC 93)
29. Update obsolete systems. (CSC 93)
30. Managing dispersed systems. (CSC 93)
31. Installing total quality management to IS. (CSC 93)

32. Installing cross functional systems. (CSC 93)
33. Managing data and document storage. (Pervan 97)
34. Information access and control. (Lee et al 95)

2.7.3 IS Human Resources Issues

1. Specifying, recruiting, and developing human resources for IS. (Pervan 93; Niederman et al 91; Pollard et al 96; Kim et al 95; Burn et al 93; Brancheau et al 96; CSC 93; Pervan 97)
2. Planing and management of the applications portfolio. (Pervan 93; Niederman et al 91; Lee et al 95; Kim et al 95; Pervan 97)
3. Education of senior management. (Pervan 93; Galliers et al 93; Pervan 97)
4. Train and educate IS professionals. (CSC 93; Lee et al 95; Pollard et al 96; Kim et al 95)
5. Train and educate end users. (Lee et al 95; Pollard et al 96).

2.7.4 IS System Development Issues

1. Improving quality of software development. (Pervan 93; Galliers et al 93; CSC 93; Niederman et al 91; Pollard et al 96; Burn et al 93; Brancheau et al 96; Pervan 97)
2. Planning and using CASE technology. (Lee et al 95; Niederman et al 91; Pervan 93;97)
3. Manage/plan systems development/ Implementation. (Lee et al 95)
4. Implementation system evaluation process. (Lee et al 95)
5. Implementing software process capability improvement. (Pollard et al 96)
6. Improving systems development process. (CSC 93)
7. Systems Reliability and availability. (Burn et al 93)

2.8 Key IS Issues Matrix

It would be possible to construct an entire research project compiling lists of key issues. It was felt that providing a "*super set*" through conglomeration would be sufficient to form the basis of a survey instrument for this research project. This approach of conglomerating was developed from Pervan (1997).

The Brancheau et al (1994-95) study was used as an initial template for the key IS issues. This study was considered as being recent enough to be relevant, and, expansive enough to be encompassing. Additional studies were reviewed (see section 2.7) and then business, technical, human resources and systems development categories were created. All IS items from the studies were then recorded (see Section 2.7). The large grouping of IS issues was then formed into a "*super set*" of key IS issues. Several of the "*super set*" issues were synthesised by collapsing and conglomerating the issues from previous surveys. The synthesised group of issues includes; Business Process Redesign, also described as *"Implement new or changed computer-supported business processes"*. Improving Data Integrity and Quality Assurances described by many researchers as *"Effective use of the data resources"*. Integrating Data Processing, Office Automation, Factory Automation, and Telecommunications, also described as *"Integrate data types"*, *" Enabling electronic data Interchange and multi-vendor integration"*, *"Developing and managing EDI Interchange"* and also as *"Planning and integrating Multi-Vendor Open systems technology"*. Integrate Networks was described as *"Telecommunication technology"* and also as *"Planning and communication networks"*. The issue Improving Security and Control was also described as *"Information access and security"*. Train and Educate IS Professionals/End users included *"Education of senior management"*, *"Train and educate end users"* and *"Facilitating organisational learning"*. Manage/Plan Systems Development/Implementation was variously described as *"Planning and using CASE technology"*, *"Implementing software process capability improvement"*, *"Systems reliability and availability"* and *"Improving systems development process"*. Improving Quality of Software Development was also described as *"Implementation systems evaluation process"*. It is important to note that several key issues cross over into multiple categories, for example, *"Education of senior management"* and *"Facilitating Organisational Learning"* could be both a human resources and a business category.

Table A: Proposed Key Issues and Indicative References

Proposed Key Issues	Type	References
Improving IS strategic planning.	B	(Pervan 93), (Pervan 97), (Galliers et al 93), (CSC 93), (Niederman et al 91), (Pollard et al 96), (Kim et al 95), (Burn et al 93), (Brancheau et al 96), (Lee et al 95).
Using information system for competitive advantage.	B	(Pervan 93), (Pervan 97), (Galliers et al 93), (Niederman et al 91), (Pollard et al 96), (Kim et al 95), (Burn et al 93).
Facilitating/ managing executive and decision support system .	B	(Pervan 93), (Galliers et al 93), (Niederman et al 91), (Pervan 97).
Manage/plan systems development/ Implementation.	S	(Lee et al 95), (Niederman et al 91), (Pervan 93), (Pervan 97), (Pollard et al 96), (CSC 93), (Burn et al 93).
Business process redesign.	B	(Pervan 97), (Galliers et al 93), (CSC 93), (Pollard et al 96), (Kim et al 95), (Brancheau et al 96), (Lee et al 95).
Planning for disaster recovery.	T	(Pervan 93), (Pervan 97), (Niederman et al 91).
Support end-user computing.	B	(Pervan 93), (Pervan 97), (Niederman et al 91), (Pollard et al 96), (Kim et al 95), (Burn et al 93), (Lee et al 95), (Brancheau et al 96).
Building a responsive IT infrastructure.	T	(Pervan 93), (Pervan 97), (Niederman et al 91), (Pollard et al 96), (Kim et al 95), (Brancheau et al 96).
Improving security and control.	T	(Pervan 93), (Pervan 97), (Lee et al 95), (Niederman et al 91), (Galliers et al 93).
Integrating data processing, office automation, factory automation, and telecommunication.	T	(Pervan 93), (Niederman et al 91), (Burn et al 93), (Pervan 97), (Brancheau et al 96), (Pollard et al 96), (Kim et al 95), (CSC 93), (Lee et al 95).
Specifying, recruiting, and developing human resources for IS.	H	(Pervan 93), (Niederman et al 91), (Pollard et al 96), (Kim et al 95), (Burn et al 93), (Brancheau et al 96), (CSC 93), (Pervan 97).
Improving quality of software development.	S	(Pervan 93), (Galliers et al 93), (CSC 93), (Niederman et al 91), (Pollard et al 96), (Burn et al 93), (Brancheau et al 96), (Pervan 97), (Lee et al 95).
Train and educate IS professionals/end users.	H	(CSC 93), (Lee et al 95), (Pollard et al 96), (Kim et al 95), (Pervan 93), (Pervan 97), (Galliers et al 93), (Niederman et al 91).
Integrate networks.	T	(Lee et al 95), (Pollard et al 96), (Kim et al 95), (Brancheau et al 96), (Pervan 93), (Pervan 97), (Niederman et al 91), (Burn et al 93).
Improving data integrity and quality assurance.	T	(Pervan 93), (Pervan 97), (Galliers et al 93), (Niederman et al 91), (Brancheau et al 96), (Pollard et al 96), (Kim et al 95), (Burn et al 93).

B:- *IS Business issues.*

T:- *IS Technical issues.*

S:- *IS System Development issues.*

H:- *IS Human Resources issues.*

2.9 Description of Key Issues

The key issues have been synthesised and presented in Table A. Section 2.9.1 to 2.9.15 present a comprehensive description of the IS issues. These will form the basis for descriptions used in the survey instrument.

2.9.1 Improving IS Strategic Planning

According to Neumann (1994) successful strategic planning for information systems should meet three criteria. Firstly, planning should incorporate processes for relating IS strategy to the existing business strategy of the enterprise. Secondly, planning should incorporate processes for assessing the existing and planned IS resources of the organisation with the objective of identifying potentially useful changes in business strategy, tactics or the process that they may support. Finally, the organisation should consider information and information systems as a strategic resource or competitive weapon and that planning should explicitly involve processes for the identification of opportunities for the use of the information resources.

Strategic IT planning is performed primarily at the business unit level and managers are beset by a number of issues that make IS planning a difficult task. Rapid changes in information technology, the emergence of end-user computing, competing methodologies for IS planning (Boyton et al 1987), the need for IS planning to relate to corporate goals, and the increasing dependence of organisations on information systems technology are all factors that make IS planning a big concern. The problem of IS strategic planning is compounded by the relative lack of attention by senior management to the IS planning process (Galliers et al 1994). This lack of a strong linkage between corporate and IS planning increases the level of uncertainty and equivocality for IS managers who are already facing a rapidly changing and complex technological environment.

2.9.2 Using Information Systems for Competitive Advantage

Competition according to Porter et al (1985) is at the core of a firms success or failure. In the early days of business computing computers were seen as devices for automating clerical procedures associated with processes such as payroll, accounting, and stock recording. It was later realised that computers could be used

to improve the quality, accuracy, and timeliness of information needed by decision makers, and the notions of management information systems and decision support systems entered management vocabulary. The accepted view was that computers were a passive element in strategic planning and that IS's role was purely to support the attainment of organisational objectives. In his seminal work Porter et al (1985) suggested that IS can play a very active role in creating competitive advantage.

A study conducted by *Datamation* (1994) concluded that the use of IT to increase the competitive advantage of organisations is the third most important issue faced by directors of information systems departments (the first two were productivity and quality.) Many senior executives now recognise that information systems technology can play a pivotal role in enhancing organisational performance, and IS managers must respond to this recognition by identifying and delivering information systems that have a strategic impact. These systems, strategic information systems support or shape the business competitive advantage by changing the manner in which business is done.

2.9.3 Understanding Business Process Redesign

Competitive advantage can be done in two major ways, firstly through a systematic incremental improvement program or life-cycle re-engineering, and secondly through business re-engineering, business processes re-engineering, or just re-engineering (Davenport 1993).

According to Hammer et al (1993) re-engineering is the fundamental rethinking and radical redesign of business process (a business process is a collection of activities that take one or more kinds of inputs and creates an output that is of value to the customers) to achieve dramatic improvement in critical contemporary measures of performance such as cost, quality, service and speed.

An analogy to Business Process Redesign (BPR) is surgery. So a question can be raised; to operate or not to operate? It is a major decision and a very expensive one.

Unfortunately, there are sometimes unsuccessful surgeries. The failure rate of BPR is very high, some estimate as high as 75-80 % (Hammer et al 1993). One reason for such failures is the inability to properly align BPR and IT and the large expenses that are necessary to re-engineer the information infrastructure and applications to support the new process. Also, organisational resistance can be a large factor. That is why BPR is considered a key IS management issue.

2.9.4 Building a Responsive IT Infrastructure

This IS management issue was considered because an information technology infrastructure is vitally important to a company, particularly in those industries going through dynamic change, those reengineering their business process, or those with widely dispersed operations. Yet executives find decisions on infrastructure investments difficult because they often have to make them before forming specific business strategies.

According to Hamell (1996) an IT infrastructure refers to the physical facilities, the services, and the management that support all computing resources in an organisation. There are five major infrastructures: computer hardware, general purpose software, networks and communication facilities, databases, and information management personnel. Infrastructure supports all types of applications anywhere in the corporation.

Creating a business-driven IT infrastructure involves decisions based on a sound understanding of a firm's strategic context. This understanding can be communicated by what we call business maxims, which capture the essence of a firm's future direction (Broadbent et al 1997). Business maxims lead to the identification of IT maxims that express how a firm should deploy IT resources and gain access to and use information. IT maxims provide a basis for a firm to make decisions on its IT infrastructure services. Executives must have a dialogue with IT mangers to ensure appropriate infrastructure services and to reduce fragmenting resources among competing strategies.

2.9.5 Facilitating/ Managing Executive and Decision Support System

This is considered an important issue because executive and decision support systems convert meaningless and voluminous data into crucial information. This is used to support and improve decision-making processes. These support systems cannot turn poor management into good management, but can help good management improve their decision making and control, with a resultant increase in profitability (Daly 1994).

Executive and decision support systems can provide competitive advantage to companies. Daneshgar (1993) states that executive and decision support systems are accepted as one of the crucial applications of the 1990s, but implementation of these systems have a very high rate of failure. The benefits associated with these systems have increased their demand but IS professionals face a number of obstacles in their successful implementation. These obstacles make the management of executive and decision support systems one of the biggest challenges faced by IS professionals today.

2.9.6 Planning for Disaster Recovery

This issue has been an important issue with IS departments for decades. Diane (1996) sees advances in communications technology greatly reducing a company's risk of losing vital operations, but the need for disaster recovery plans has increased because of the growing reliance on advanced technology.

Each day an organisation is exposed to disasters which threaten critical functions. Disaster can be divided into two categories, natural disasters and those caused by people. Natural disasters include earthquakes, fire, flood, hurricanes, lightning tornadoes. Human disasters include power failure, communications outages, explosions, fire, sabotage and structural failure. Destruction (Diane 1996) of all or most of the computing facilities can cause significant damage to an organisation.

A disaster recovery plan is a comprehensive set of action steps to be taken before, during and after a disaster. The plan is documented and tested to ensure the

continuity of operations and availability of critical resources after a disaster. According to Fried (1995) every company is different and the business recovery plan will need to reflect the differences in core functions, recovery windows, customer service and regulatory issues. Knoll (1986) describes disaster recovery as the chain of events linking planning to protection to recovery. The purpose of a recovery plan is to keep the business running after a disaster occurs and should focus first on recovery from a total loss of all capabilities. According to Butler (1992) the major benefits from developing a comprehensive business recovery plan can be summarised as:

- Minimising potential economic loss;
- Reducing legal liability;
- Reducing disruption to normal operations;
- Improving organisational stability;
- Improving orderly recovery;
- Minimising insurance premiums;
- Reducing reliance on key personnel;
- Increasing asset protection;
- Ensuring safety of personnel and customers;
- Compliancing with legal and regulatory requirements;
- Minimising decision making during a disaster.

Disaster recovery planning can be very complex, and it may take several months to complete. This issue is important because according to Loch (1992) if an organisation is fortunate enough to survive a disaster without a plan for recovery, it will not survive unscathed. Aside from the direct revenue losses incurred during the failure, the organisation will also suffer tangible and intangible costs such as cash flow interruption, loss of customers, loss of competitive edge, erosion of industry image, and reduced market share.

2.9.7 Supporting End-User Computing

Before the 1980s, all large computer-based information systems were developed by data services departments that required a small statement of requirements from the end-users (Davis et al 1993). This issue was included because significant changes have taken place in information systems over the past decade. Ten years ago, the

main IS function were to acquire, deploy and operate information resources for an organisation. Today, these responsibilities have been transferred to the end-users who ultimately use IS output. This burst in end-user computing is due to the introduction of cheaper personal computers and powerful software (Guimaraes, 1996).

According to Mirani et al (1994) end-users are individuals who are willing to use computer resources to get their jobs done. End-user computing is defined as the use and/or development of information systems by the principal users of the systems' outputs or by their staff (Wetherbe et al 1986).

According to McLean et al (1996) end-user computing has grown for several reasons:

- Many applications, especially those that are retrieval and analysis-oriented, may readily be done by the user;
- Lead times on development requests may be shorter when end-users develop their own systems;
- End users may have more control over system development and use;
- IS department procedures may not be appropriate for small applications;
- The IS department may not be perceived as being concerned about user's needs;
- End users may want to learn more about computing;
- Costs may be lower when end-users develop their own systems.

IS departments also benefit from the growth of end user computing. Firstly, the shortage of systems development personnel can be relieved, allowing IS executives to use their expensive human resources on longer, more technical development projects. Secondly, if users know their requirements, they can implement them directly into a system and thus avoid the time consuming and error-prone process of communicating requirements to an outside developer. Finally, systems implementation becomes the responsibility of the users (Mirani et al 1994).

According to McLean et al (1996) there are risks attached to end-user computing. Firstly, end-users acting independently cannot always be expected to use organisational resources (hardware, software and data) in ways that are optimum for the whole organisation. Secondly, end-user computing bypasses the monitoring and control mechanisms built into the IS department, there is no formal check on user behaviour. Finally, problems like inadequate documentation, poor data, faulty backup procedures, and lack of data security can be common with end-user applications.

There are clear benefits and risks, but end-user computing with desktop PCs is inevitable. This is an important issue because it is the responsibility of IS executives and managers to maximise corporate business benefits and, at the same time, minimise risks and constraints on user initiative, business knowledge, and unity.

2.9.8 Improving Security and Control

This issue was considered important for the survey because according to Hinton (1992) the issue of security is fast becoming every IS manager's biggest headache as more use is made of information technology to store and manage sensitive data. The security of information systems has assumed greater importance due to the sheer wealth of computer systems now in use, the huge numbers of people who use them, and the fact that the traditional barriers between the computer room and the general office has blurred.

According to Hinton (1992) the threats to computer security have arisen due to the following reasons:

- Computer systems are vital and the risks are higher, as more organisations are becoming more if not completely dependent upon computer-based information. The total loss of information can cause great short-term inconvenience, incur high costs and can also cause irretrievable damage to the business;
- Computers can locate and correlate information efficiently;
- Computers are easily accessible by multiple-user or networked computers enabling people to access information that may be confidential or commercially valuable;

- Computers are now able to connect to the outside world which has opened up a physical inroad to the organisation's computers, making them vulnerable to outside attack;
- Information sharing can also increase the risk of people inadvertently or maliciously deleting or damaging important information.

Controls are countermeasures to threats. Controls are the tools and procedures used to counter risks from the variety of people, actions, events, or situations that can threaten an information system. Controls range from simple deadbolt locks on office doors that reduce the threat of information systems equipment to devices that read the palm prints of personnel to prevent unauthorised access to sensitive data (Robert et al 1989).

The controls can be classified in the following categories (Robert et al 1989).

2.9.8.1 Physical controls

These controls uses conventional, physical protection measures. Physical controls include controls over the access and use of computer facilities and equipment and controls for the prevention of theft. They also include controls that reduce, contain or eliminate the damage from natural disasters, power outages, humidity, dust, high temperatures and other environmental threats.

2.9.8.2 Electronic Controls

These controls uses electronic measures to prevent or identify threats. They may include intruder detection and biological access controls, such as log-on Ids, passwords, badges and hand, voice, retina print access controls. Physical and electronic controls are often used together to counter a threat.

2.9.8.3 Software Controls

These are program code controls used in information systems applications to prevent, identify, or recover from errors and unauthorised access. Software controls may also include programs that disable computer terminals during certain hours and programs that monitors who logs on, how long they are connected for, what files they access, and what type of access they make to those files.

2.9.8.4 Management Controls

These controls often result from setting, implementing and enforcing policies and procedures. For example, employees may be required to back up their data at regular intervals and store the back up copies at a secure off-site location. Managers can expect that new technology will give rise to new security concerns making this a high profile issue.

2.9.9 Plan/Implement/Manage Systems Development

Systems development refers to structuring hardware and software to achieve effective and efficient processing of information systems. Since hardware is increasingly available for off-the-shelf acquisition and interconnection, development most often encompasses the structuring or programming of application software that will command the hardware (Bell, 1992).

The traditional way of building computer systems is referred as the Systems Development Life Cycle methodology (SDLC) and consists of three phases (Bell, 1992). The first phase is called the definition phase which defines what the system must do in great detail so that computer specialist can build the needed system. In the second or construction phase the IS department specialist produces a working system. In the last phase, implementation phase, the new system is installed, operated, and modified so that it continues to satisfy the changing needs of the organisation.

The SDLC is not without it disadvantages (Bell 1992). Firstly, the most obvious disadvantage of SDLC methodology is the necessity of defining the requirements completely and accurately at the start. The requirements may change, or may be temporary and may not be known fully in the early stages of development. Finally this type of development is often long and costly. All these drawbacks in SDLC methodologies give rise to the need for new system development approaches.

According to Schultheis et al (1995) the emerging information systems development tools can be classified into three types.

2.9.9.1 Integrated CASE (I-CASE) Tools

These tools support prototyping and reusable systems components, including component repositories and automatic computer code generation. The latest I-CASE tools are actually hybrids that blend traditional development approaches with the latest thinking in development. Since the tools are based partially on traditional approaches, they are often less flexible in supporting rapid prototyping when compared to loosely-coupled tool sets and object-oriented development environments.

2.9.9.2 Loosely-Coupled Tools Sets

These tools represent one of the fastest growing and most popular of the new approaches to development tools. Loosely-coupled tools sets are independent tools, developed by different tools vendors, to support one or more information systems architecture layers. Under this scenario, a developer uses the best tools for each layer and then assembles and develops components for each layer that are subsequently "hooked" together to produce an operational systems. Developers building systems using such tools report that production prototyping is well supported, and development proceeds rapidly with significant client interaction using a prototype to test viability.

2.9.9.3 The Object-Oriented Development

This paradigm is a significant departure from the past and a tools approach that significantly changes the way development is accomplished. Firstly, object-oriented development is more than a programming language or a tool set, it is a perspective or paradigm, a new view of the application domain. Secondly, successful object-oriented development efforts use an object-oriented development environment that includes an object-oriented programming language, a layered object architecture, an object class library that includes a collection of object classes for each layer of the architecture, search tools, debuggers, operating systems interfaces, and interfaces to other languages and systems. This issue is important because with the emergence of these new development tools the developer has many options for better planning, implementation and management of systems, from traditional development methods and tools sets to more advanced object-oriented development environments.

2.9.10 Improving the Quality of Software Development

This issue was important because the single biggest obstacle inhibiting the rapid expansion of information technology is the inability to quickly create high-quality, low-cost software, that meets the expectations of the computer user and that operates flawlessly without human intervention (Howard, 1989).

For the last 20 years, the information technology industry has focused in on techniques for improving productivity. The result was the introduction of a plethora of tools including text editors, libraries, code generators, 4GLs, CASE (Computer Aided Software Engineering) tools, Artificial Intelligence (AI) and so on. Despite these tools, the complexity of the software systems still increases and quality continues to be elusive. The solution to the software development dilemma is to concentrate on quality rather than productivity.

There are two ways to develop high quality software according to Shawn (1990). Quality can either be inspected into the software, or quality can be built into the software. In the first case, the software requirements are defined, errors are identified, and the errors are corrected. The software design is developed, errors are detected, and errors are corrected. Next the software is coded, errors are corrected. Then the software is tested and, again, error detected and corrected. The software is installed and, again errors detected and corrected. This is obviously a labor intensive method.

However, when quality is built into the software, the process takes on a different perspective. Here the software is produced, but effort is expended on identifying the sources of the error. The source of errors is located, and effort is expended on methods to permanently resolve the error-producing condition.

According to Howard (1989) automate as many aspects of the computer development process as possible, use CASE technology, artificial intelligence tools and 4GLs. Transfer as much of the software development process to the computer user. Every automated tool that reduces human intervention in the software

development process improves quality, and every action that reduces the need to communicate specifications for software from users to computer professionals improves quality.

The solution requires a belief that quality is achievable and a commitment to make it happen. If the information technology professional does not accept the notion that flawless software can happen it will never happen. Furthermore, everyone must understand why quality has to happen.

2.9.11 Specifying, Recruiting and Developing Human Resources for IS

The importance of this issue has been recognised a long time with headlines in Computerworld Australia from 1988 commenting, "Skills famine won't go away", and " Short-fall in skills is worsening". According to Bob (1997), it comes as no shock that a poll of senior human resources executives ranks information systems/technology personnel as the hardest to find.

While every department in today's business organisation requires employees with enhanced skill sets, IS groups are special cases. The technology is continuously changing, while users appetites for applications (Rivka 1997) and their expectations seem insatiable.

Fundamentally, there is a lack of research on IS personnel management to provide guidance for IS managers and until more work is done in this area, IS managers will lack the necessary information to plan and manage human resources development. The human resources issue is therefore likely to remain a major concern.

2.9.12 Train and Educate IS Professionals/End-Users

This issue was considered because many organisations do not make the best use of their investments in business systems because they have underinvested in user awareness, training and support. If an organisation is implementing a new system or new applications training end-users and the technical support staff who will maintain the systems will be a key factor affecting the overall success of the project (Alter 1996). If staff are not trained, an employer will not get what they are paying

for, and the employee will fall behind the times very quickly. This is not a scenario that anyone wants (Barker 1997).

According to David (1996) there are usually four groups of people who should receive training. Firstly, the technical support staff, because they are required to install, customise and configure the system. Secondly, system/network manager/administrator because they are responsible for the day-to-day running of the new system. Thirdly, applications support staff developing in-house applications. Fourthly, the end-users who are eventually going to use the systems.

The importance of this issues is made clear, when according to Joseph (1997) it is difficult to find young people who are ready and equipped to come to an IS organisation even at an entry level. Furthermore undergraduate programs in IS and computer science are struggling to keep pace with warp-speed technological and business change. According to a recent article (Richard 1997) if you don't train, your skills will be out of date within six to twelve months.

Businesses that find that they lack time, resources, or the expertise have found outsourcing to be valuable in the training area. Outsourcing provides a great deal of flexibility for organisations in hiring professionals versed in cutting edge technology. Outsourcing also helps downsizing, cutting training costs, and overcoming shortfalls in multi-skilled IT personnel (Eckerson 1990). The above literature proves that this is an important issue and has a big effect on the IS professional's future.

2.9.13 Integrating Data Processing, Office Automation, Factory Automation, and Telecommunication

Office automation involves a set of office-related functions that may or may not be integrated into a single system. The most common functions are electronic mail, word processing, document copying, document preparation, document storage and imaging, voice mail, desktop publishing, and electronic calendering. Because of the technological and organisational implications that office automation systems have in such areas as communications, database access, and distributed processing, the

design of information systems within many organisations is going to be greatly affected (Hicks 1993).

The introduction of office automation systems has been evolving with electronic mail and voice mail most likely to bring about changes not only in the traditional office structure but also in the structure of the organisation as a whole.

Cats-Baril et al and Thompson (1997) explained that as organisations have moved towards office automation, they have learned some important lessons. Firstly, the process of office automation must be coordinated as each office unit cannot go its own way. The various islands of automation must be made compatible. In most organisations the IS organisation has been given the responsibility for corporatewide office automation. Secondly, the emphasis must be on the information requirements. Thirdly, training and education of all parties involved is a necessary prerequisite for a successful system. Fourthly, office automation should be an evolutionary process, moving towards the mythical office of the future, but not expecting to get there overnight. Finally, the redefinition of the function of the office and the restructuring of individual roles may be required to achieve the maximum benefits of office automation.

Information technology is increasingly being used for electronic commerce. Many types of electronic commerce involve the use of Interorganisational Systems (ISO), which link two or more organisations. EDI (Electronic Data Interchange) is used to electronically transmit common business documentation, such as purchase orders and invoices. In other cases virtual organisations are created where different companies focus on different aspects of operations and information technology provides the communication links among them. This rapid growth in information technology has raised many issues, including, security, confidentiality of information, censorship and intellectual propriety rights (Rowe 1991). Due to the above concerns this issue is important not only in present environment but also likely to be an important issues in the future.

2.9.14 Integration of Networks

This issue is considered important because according to Chernicoff (1993) the decade of 1990s may well become known as the era of networking. Harvey (1994) established that networking can be used to gain competitive advantage over your competitors.

Organisations that connect their computers to networks rather than developing isolated computer systems and individual PCs, will acquire the following benefits. They can:

- Share information by giving users access to databases from their desktop workstation;
- Share expensive equipment such as laser printers;
- Communicate with other individuals or parts of the organisation. User can use e_mail to keep in touch with other people independent of distance or location. They can also communicate with the outside world;
- Manage business system documents and data safely and efficiently;
- Encourage the use of standard software, streamlining support, training and the exchange of information;
- Enable more flexible working arrangements and work sharing. Information processing is no longer restricted by geographical location;
- Reduce the cost of hardware and software.

With networking providing business such great benefits it is no wonder that more and more organisations are turning towards this emerging technology. This makes managing and integration of networks a major concern for IS professionals in the future.

2.9.15 Improving Data Integrity and Quality Assurance

This issue was considered important because quality is generally transparent when present, but easily recognised in its absence, eg. when a new car falls to pieces, or a computer program fails to perform properly. According to Kitchenham (1989) quality is "*hard to define, impossible to measure, easy to recognise*".

The Oxford English Dictionary (OED, 1990), states that quality is "*The degree of excellence*". According to Gillies (1992) quality means zero defects. Another author Hunt (1993) defines quality as fitness for purpose. An alternative formal definition of quality is provided by the International Standards Organisation (ISO, 1986), "*The totality of features and characteristics of a product or service that bear on its ability to satisfy specific or implied needs*".

All the definitions provided can be applied to data. Kitchenham (1989) refers to data quality as "*fitness for needs*" and claims quality involves matching expectations. This definition specifically recognises the two features of a piece of quality data: conformance to its specification and fitness for its intended purpose.

According to Howard (1989) the whole future of information technology is bound to the ability of information technology professionals to product high-quality, low-cost data processing that meets the expectations of the computer user.

Conclusion

Advances in information technology have had an immense effect on the business environment. Changes in the technical and business environment have given rise to new issues in the management of information systems. These issues need to be identified, monitored and analysed in order to allow and prepare information systems professionals for the future.

The first section of this chapter presented an historical overview of information systems and charted the development of key IS issues and trends. The second section presented the "*Super Set*" of 15 key IS issues which form the basis for the survey instrument. These key issues are described and were used to ascertain the views of IS professionals in large Australian organisations. Several trends were explored including the comparison of the IS issues with previous Australian as well as overseas studies and also the possible impact that the industry group, level of IS professional and size of IS department has on these issues.

3.Research Methodology

Synopsis

The general research objectives are presented along with the four specific research questions. The research scope and research questions in detail are presented along with the data collection methodology. The collection method and descriptions of the construction of instruments used to collect the data, the instrument themselves, the sample used and the response rate for this research are also presented.

3.1 Research Objectives

The major research objective is to ascertain the key issues in the management of information systems in the Australian business environment, and how these issues compare with previous international and Australian studies. A further objective is to ascertain emerging trends in information systems and the possible effect that IS respondent level, IS department size and industry groups have on key IS issues.

To achieve the above objectives the following key research questions are proposed:-

RQ1: *What are the key issues in information systems management in the Australian business environment?*
RQ2: *How do these key issues compare with international and previous Australian studies?*
RQ3: *Are there any emerging information systems issues?*
RQ4*: Does industry group, IS respondent level or IS department size effect the perception of key IS issues?*

3.2 Research Method

The aim was to establish a baseline of knowledge about key issues in the management of information systems in the Australian environment, therefore a field study was required.

The principal field study methods of experiment, case study, and survey were examined for possible use and the survey method (postal questionnaire) and statistical analysis was chosen. Experimental methods were ruled out due to the need to collect multiple respondent views of key issues. Case studies were ruled out because they would only be able to study a few organisations and the results from a small sample may not be entirely valid.

A survey can be conducted in several ways. Interviews could be performed face-to-face or could be done by telephone, or by mailing questionnaires to potential respondents. The use of face-to-face interviews was ruled out as being both too expensive and too limiting. We could not reach a large enough sample of organisations in a reasonable time in person to support our aim of detecting a pattern of fit. Telephone interviews could greatly reduce the expense involved in personal interviews, however, due to the number of respondents required and their position in the firm, co-ordination of telephone interviews would lead to great complications and inevitable delays in the collection of data. Thus, a mail survey would be more suitable to reach a large number of organisations in a reasonable time period. According to Zikmund (1991) the advantages of survey research method include flexibility and time efficiency. Surveys provide a quick, inexpensive, efficient, and accurate means of assessing information about a population.

3.3 Research Instrument

The questionnaire had three sections. The first section established industry sector, size, the number of IS staff and their position in the organisation. The second section identified the key issues in the management of information systems. The third

section was optional and it required IS professionals to add more IS issues which they considered important and were not covered in the survey. In the first two sections, two research instruments were used to measure respondent data. The first section employed multiple choice alternatives (Zikmund 1991) and the second section employed a nine point Likert-type scales (Torgerson 1958). The questionnaires was addressed to the IS professionals in each organisation.

Having settled on types of scale to be employed, each section was operationalised so that it could be measured in real terms, rather than in theoretical terms. Research Questions One and Two (key issues and comparison) were analysed by frequency, percentage with mean and standard deviation. The key IS issues were then ranked in order by mean and then grouped. Research Question Three (new trends) was analysed by frequency of response and then categorised into "new" issues and "repeat" issues. Research Question Four (industry group, IS level, IS size) was analysed by crosstabulated percentages to yield trends. Post-hoc Kruskall Wallis one-way ANOVA (Coakes et al 1996) was then used to determine if any significant difference existed between the IS factors.

3.3.1 The Survey

The Organisation: The instrument used in this study established industry sector and size. This was completed by the IS professionals and consisted of five short questions with multiple choice options (Zikmund, 1991). These are detailed in Table 1. The survey instrument is presented in Appendix F.

Table 1: Organisational Instrument.

	Organisational Instrument.
1.	Circle the number that indicates your organisation's Major industry group.
2.	What is the size of the workforce of your organisation?
3.	How many Information Systems staff are in your organisation?
4.	What organisational level describes your position?
5.	What IS level best describes your position?

Key IS management issues: The second section of the survey consisted of the 15 key information systems management issues in the Australian environment. Each issue was briefly described to help respondents gain a greater insight into the key issues. The question yielded a potential score from a minimum of one to a maximum of nine. The key issues are detailed in Table 2.

Table 2: Key issues in the management of Information Systems.

	Key issues in the management of Information Systems
1.	Improving IS strategic planning
2.	Using information systems for competitive advantage.
3.	Plan/Implement/Manage systems development.
4.	Facilitating/managing executive and decision support system.
5.	Understanding business process redesign.
6.	Planning for disaster recovery.
7.	Supporting end-user computing.
8.	Building a responsive IT infrastructure.
9.	Improving security and control.
10.	Integrating data processing, office automation, factory automation, and telecommunication.
11.	Specifying, recruiting, and developing human resources for IS.
12.	Improving Quality of software development.
13.	Train and educate IS professionals/end users.
14.	Integration of networks.
15.	Improving data integrity and quality assurance.

3.3.2 Survey Design

There were two distinct surveys carried out, the pilot and the main survey.

The pilot survey obtained:

- Indications of additions and corrections to be made to the instruments before the main survey;
- An assessment of the validity and reliability of the instruments to be used in the main survey;
- Estimation of the sample size required for desired statistical power in the main survey (Cohen 1969).

The pilot survey consisted of a series of questions with Likert-type scale and multiple choice alternatives to measure industry sector and size of the organisation and key IS management issues.

3.4 The Sample

The sample for the main survey was selected from an Australian wide database of organisations. The database was obtained from a Victorian based university (the name of database is not mentioned due to confidentiality restrictions). The database consisted of over 600 organisations with industry sector, size and state the being main groupings. Respondents were sampled from the states of Victoria, New South Wales, Queensland and selected organisations with number of employees greater than 500. Employee number was chosen as a determinant of size and according to Hall (1987) size can traditionally be measured by the number of employees in an company. Other alternative means of size measurement, such as total assets or total annual sales were not available. The final sample consisted of 450 potential respondents. The questionnaires were sent to all selected organisations which were required to complete the survey ASAP. A total of 99 organisations returned questionnaires, for an overall response rate of 22.0% (see Table 3 for comparison of respondents to mailing). The total number of survey returns included three organisations who refused to participate in the survey. The stated reason was that organisational policy did not allow surveys to be completed. Nineteen surveys were returned because the mailing addresses were incorrect. One survey was incomplete and was not used in this study. A total of 76 organisation returned a completed questionnaire for a response rate of 16.8%. (see Table 3).

Table 3: Comparison of Responding Firm to Total Mailing.

	Total	Percentage Rate of Sample Size
Mailing Database	600	-
Sample Size	450	-
Total Returns	99	22.0%
Useable for Organisation	77	17.1%
Useable for Research	76	16.8%

Although the response rate of 16.8% was satisfactory a follow-up mailing to non-respondents was considered however this was not done due to time and financial constraints.

Conclusion

In this chapter the research project was described in detail, including research objectives, research questions, and the method used to collect data from the different organisations. The data collected was based on 76 correctly answered questionnaires. The next chapter presents the findings used to analyse the data.

4. Data Analysis and Findings

Synopsis

This chapter is divided into three sections. The first section includes a description of respondent demographics including: industry grouping, size of work force, size of information systems department, level within the organisation and information systems level. The second section presents the key issues findings together with post-hoc analysis of the key issues v/s industry group, department size and IS level. The third section presents new IS issues as proposed by respondents which may form the basis for future research.

4.1 Demographics

Table 4 represents each respondent's industry grouping. There are nine groups; Mining or Petroleum, Insurance or Financial services, Banking or Lending, Services including Transport, Retail or Distribution, Manufacturing Industry, Public Sector, Education and Training and Other. The findings in Table 4 show that Manufacturing Industries had the highest number of respondents (38%). Other industry groups (20%) had the second highest with Mining and Petroleum (13%) the third highest. Insurance & Financial services (11%), Services including Transport (8%), Retail or Distribution (8%) and Banking or Lending (1%) made up the rest of the respondents. Education and Training Sector had no respondents to the survey. Respondent industry groupings are displayed in Graph 1. The industry groups that are included in the Other grouping are described in Appendix D. The Other category was re-categorised after assuming the respondents were not able to define their industry group appropriately see Table 5 and Graph 1.

Table 6 and Graph 2 represents the size of the work force of the respondent's organisation. There are three groupings: less than 100, between 100 and 500 and

greater than 500. As shown in Table 6 the highest number of respondents were from organisations greater than 500 (88%). Respondents between 100 and 500 and less than 100 combined(12%) for the rest of the sample. The high response rate from large organisations reflects the sample as selected for the survey.

Table 4: Industry Groups before re-categorising others
(N= 76)

Variable	No. of Respondents (N = 76)	Respondents (%)
Industry Group		
Mining or Petroleum	10	13
Insurance or Financial Services	8	11
Banking or Lending	1	1
Services including Transport	6	8
Retail or Distribution	6	8
Manufacturing Industry	29	38
Public Sector	1	1
Education and Training	0	0
Other	15	20
Total	76	100

Table 5: Industry Groups after re-categorising others
(N= 76)

Variable	No. of Respondents (N = 76)	Respondents (%)
Industry Group		
Mining or Petroleum	15	20
Insurance or Financial Services	8	11
Banking or Lending	1	1
Services including Transport	14	18
Retail or Distribution	6	8
Manufacturing Industry	31	41
Public Sector	1	1
Education and Training	0	0
Total	76	100

Graph 1: Industry Groups
(N= 76)

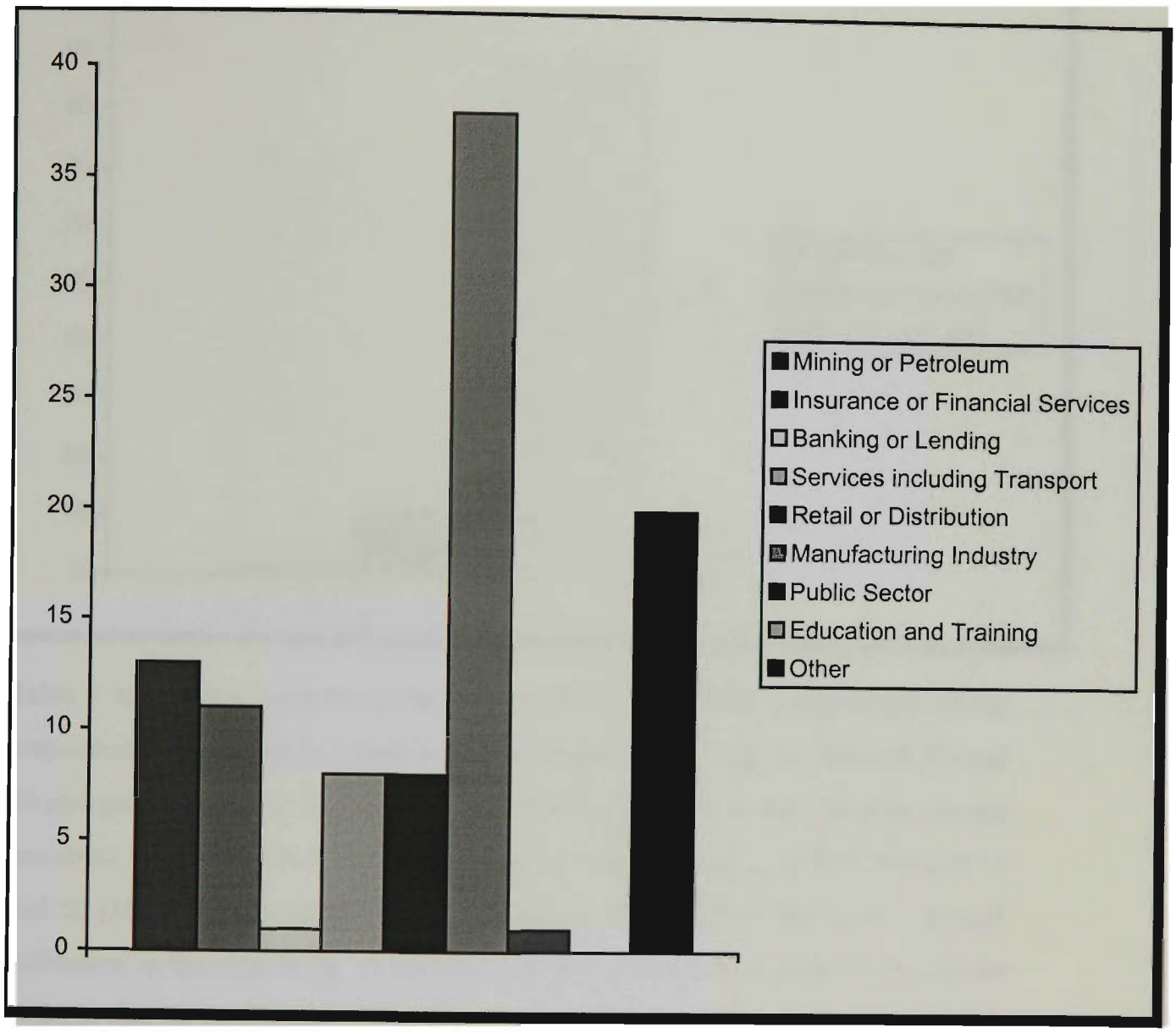


Table 6: Size of Work Force
(N= 76)

Variable	No. of Respondents (N = 76)	Respondents (%)
Work Force		
Less than 100	1	1
Between 100 and 500	8	11
Greater than 500	67	88
Total	76	100

Graph 2 Size of Work Force
(N= 76)

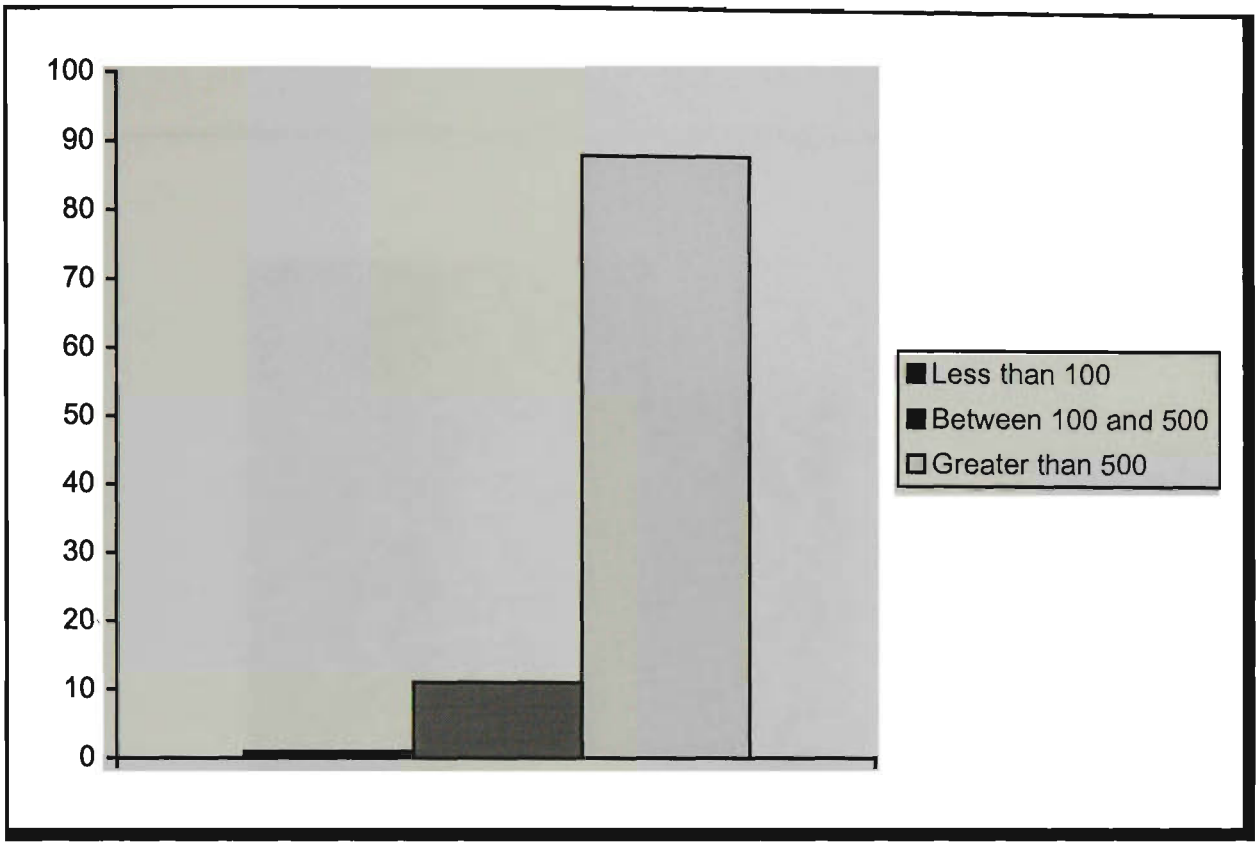


Table 7 and Graph 3 represents the size of information systems department in the respondent's organisation. There are three grouping: less than 10, between 10 and 50 and greater than 50. The findings in Table 8 and Graph 4 show that the sample has about even numbers of the three groupings with less than 10 (36%), between 10 and 50 (36%) and greater than 50 (28%). These findings show that there is a large difference in the size of the IS departments within these organisations. This could indicate that IS people/resources are either dispersed across the organisation or are outsourced.

Table 7: Size of Information Systems Department
(N = 76)

Variable	No. of Respondents (N = 76)	Respondents (%)
IS Staff Size		
Less than 10	27	36
Between 10 and 50	27	36
Greater than 50	22	28
Total	76	100

Graph 3: Size of Information Systems Department
(N = 76)

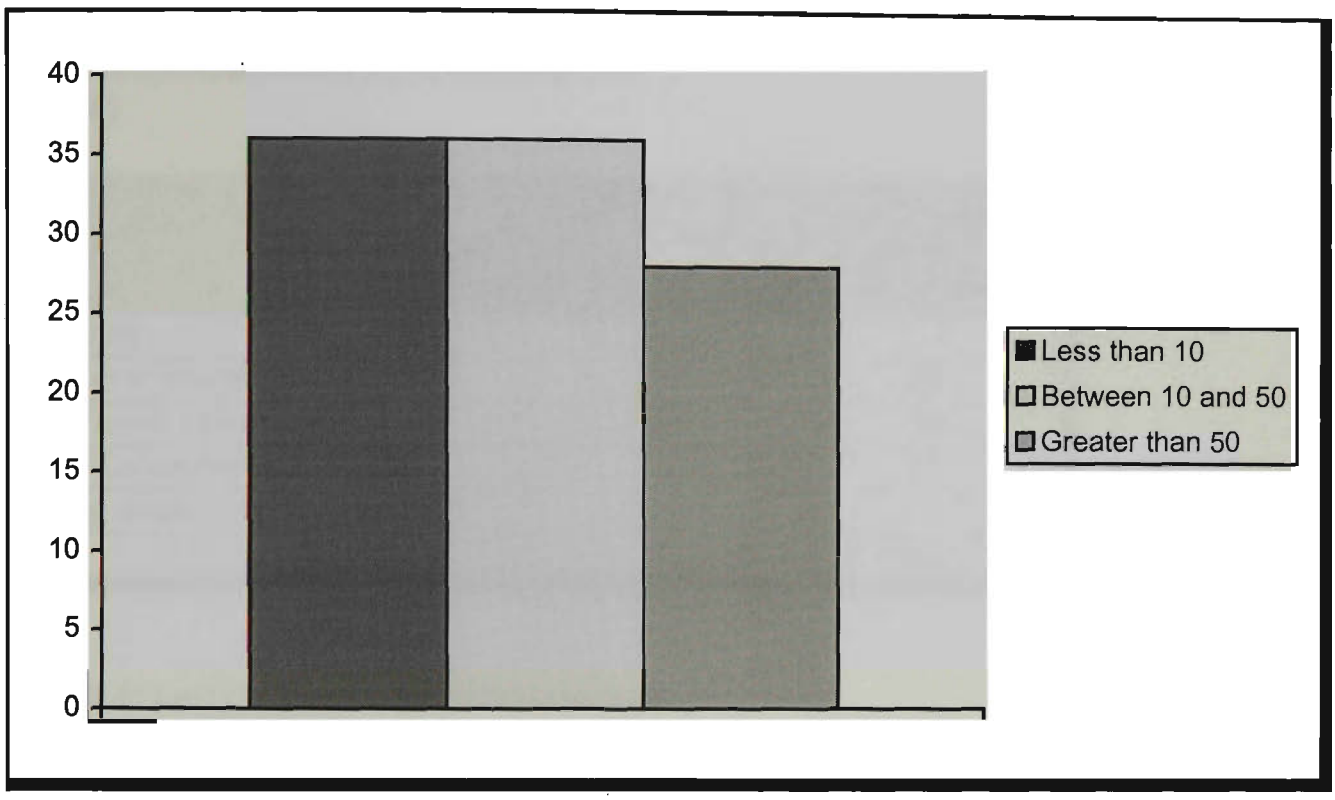


Table 8 and Graph 4 represents each respondent's position within the organisation. There are four groupings; one level below CEO, two levels below CEO, three levels below CEO and four or more levels below CEO. The findings in Table 8 show that two levels below CEO has the largest group of respondents (59%), while the second largest was one level below CEO (19%). Three levels below CEO and four or more levels below CEO accounts for the same (11%) number of respondents.

Table 9 and Graph 5 represents each respondent's position within the IS department. There are four groupings; head of IS section, one level below IS head, two or more levels below IS head and other. The findings in Table 9 show that head of IS section has the largest group of respondents (79%), while the second largest was one level below IS head (16%). Third largest was two or more levels below IS head (4%) and others accounted for (1%) of the respondents. The findings in Table 8 and Table 9 show that most respondents were from the top level of management or head of the

IS department. These respondents are involved in making critical decisions and should have a broader picture of IS issues. Having a sample consisting largely of the head of the IS department one or two levels below CEO within large organisations added greatly to the credibility and accuracy of the survey results.

Table 8: Level of Positions in Organisation
(N= 76)

Variable	No. of Respondents (N = 76)	Respondents (%)
Positions		
One Level below CEO	15	19
Two Levels below CEO	45	59
Three Levels below CEO	8	11
Four or more Levels below CEO	8	11
Total	76	100

Graph 4: Level of Positions in Organisation
(N= 76)

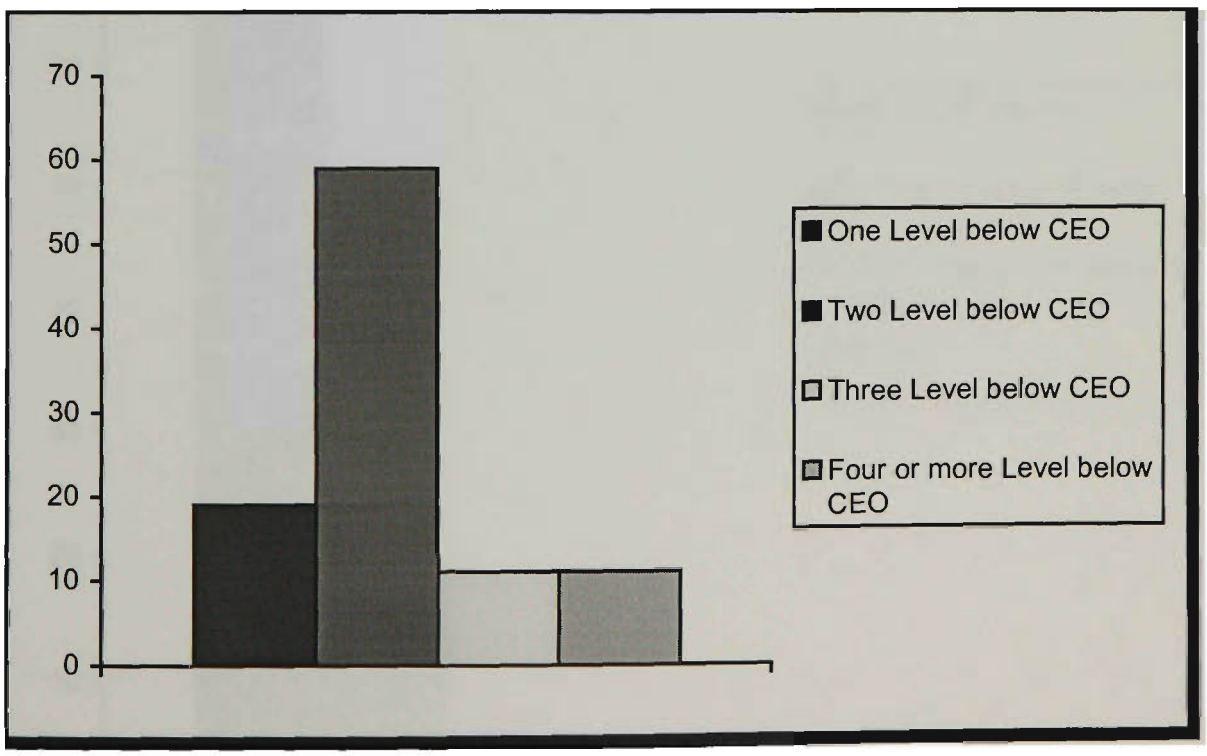
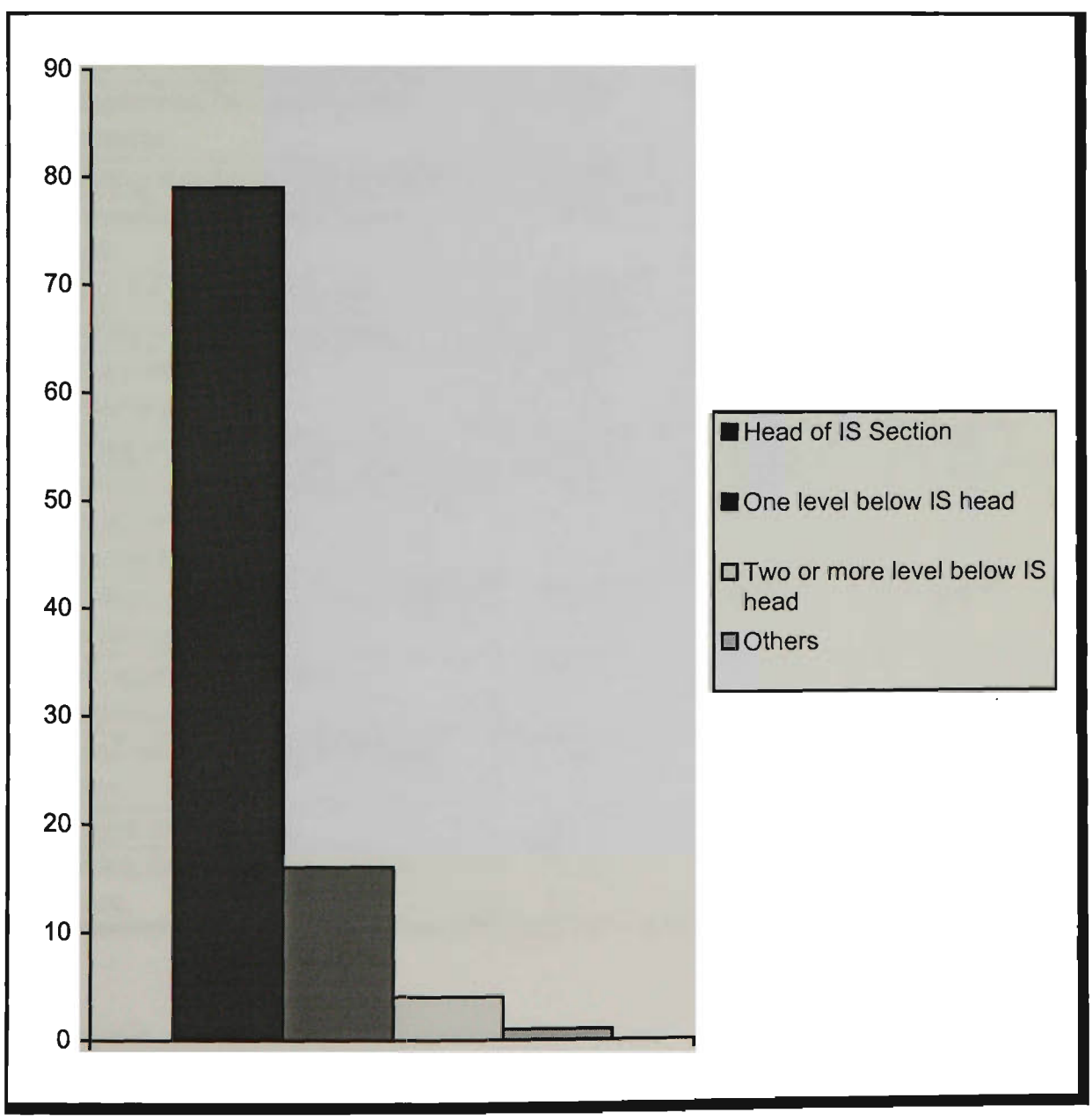


Table 9: Information Systems Level
(N=76)

Variable	No. of Respondents (N = 76)	Respondents (%)
Information systems level		
Head of IS Section	60	79
One level below IS head	12	16
Two or more levels below IS head	3	4
Others	1	1
Total	76	100

Graph 5: Information Systems Level
(N=76)



4.2 Data Assumption Testing

Before applying statistical procedures, data abnormalities and statistical assumptions were tested. No examples of missing data were encountered. Outliers were classified as values less than 1 or more than 9. Each research variable was examined individually and no outliers were observed.

Table 10: Assumption Testing

Key IS Management issues.	Skewness (Coakes & Steed, 1996)	Kurtosis (Coakes & Steed, 1996)	K-S Lillefors (Coakes & Steed, 1996) $p < .05$
Improving IS strategic planning.	-.7677	-.2464	.0001
Using IS for competitive advantage.	-.6577	0.2521	.0002
Plan/Implement/Manage systems development.	-.6443	-.3209	.0072
Facilitating/managing ESS and DSS.	-.2045	-.5851	.0014
Understanding Business process redesign	-.3678	-.3504	.0183
Planning for disaster recovery.	-.3000	0.4389	.0498
Supporting end-user computing.	-.8901	0.3835	.0346
Building a responsive IT infrastructure.	-1.101	0.9698	.0083
Improving security and control.	-.6394	0.2135	.0247
Integrating data processing, office and factory automation, and telecommunication.	-.2328	-.8152	.0233
Specifying, recruiting and developing human resources for IS.	-.4874	.8273	.0020
Improve quality of Software Development.	-.5511	-.1341	.1726
Train and educate IS professionals/ end users.	0.1212	-1.4449	.0000
Integration of networks.	-.9241	0.3467	.0289
Improving data integrity and quality assurance.	-.7688	0.4720	.0173

The sample size of 76 was not great enough to assume normality therefore several statistical tests were performed to determine normality. Frequency histogram and normal probability plots were both performed. Both graphical tests were

inconclusive as to whether normality could be assumed. Skewness and kurtosis were analysed to determine normality as well as K-S Lillefors statistic (Coakes et al 1996). Skewness and kurtosis measure the shape of the distribution and are zero if the curve is normal. K-S Lillefors measures normality of distribution and if K-S Lillefors statistic is ($p>.05$) greater than zero then normality can be assured. From Table 10 we see normality cannot be assumed and therefore non-parametric statistics were employed.

4.3 IS Issues

To aid readability the key IS issues have been abbreviated in Table 11. The abbreviations will be used in all subsequent tables.

Table 11: Issues by Abbreviations

Key IS Management issues.	Abbreviations.
Improving IS strategic planning.	IS strategic planning
Using IS for competitive advantage.	IS for competition
Plan/Implement/Manage systems development.	Systems development
Facilitating/managing ESS and DSS.	ESS and DSS
Understanding Business process redesign	BPR
Planning for disaster recovery.	Disaster recovery
Supporting end-user computing.	End-user computing
Building a responsive IT infrastructure.	IT infrastructure
Improving security and control.	Security and control
Integrating data processing, office and factory automation, and telecommunication.	Integrated systems
Specifying, recruiting and developing human resources for IS.	Human resources for IS
Improve quality of Software Development.	Software Development
Train and educate IS professionals/ end users.	Education of IS staff
Integration of networks.	Networking
Improving data integrity and quality assurance.	Quality assurance

The full 9 point Likert scale of the key IS issues is presented in Appendix C. In Table 12 the 9 point Likert scales are aggregated into 5 point likert scales. The Likert items 1 & 2 were combined to yield Strongly Disagree. Similarly items 3 & 4, 6 & 7 and 8 & 9 yielded Disagree, Agree and Strongly Agree respectively. Likert item 5 yielded Neither Agree nor Disagree. The results in Table 12 show the percentage (%) response for the key IS issues. Analysing the results from Table 12 yielded three possible broad groups of responses. These groups have been termed: unanimous agreement (ua), probable agreement (pa) and ambivalent (am). These three groups were ascertained by summing the percentage (%) response of the Agree & Strongly Agree and Disagree & Strongly Disagree items. These groupings are displayed in the column heading "*Groups*". This type of grouping was also performed by Pervan (1996) his groupings included critical issues, important issues and problematic issues.

Table 12: IS Issues

Key IS management Issues.	Strongly Disagree (%) Likert 1&2	Disagree (%) Likert 3&4	Neither Agree nor Disagree (%) Likert 5	Agree (%) Likert 6&7	Strongly Agree (%) Likert 8&9	Groups
IS strategic planning	0	0	3	28	69	ua
IS for competition	0	1	6	44	49	ua
Systems development	0	9	11	38	42	pa
ESS and DSS	0	13	22	45	20	pa
BPR	1	10	19	42	28	pa
Disaster recovery	1	9	18	43	29	pa
End-user computing	1	12	8	51	28	pa
IT infrastructure	1	7	4	37	51	ua
Security and control	1	11	9	51	28	pa
Integrated systems	1	23	19	33	24	am
Human resources IS	7	19	10	43	21	am
Software Development	10	12	13	44	21	am
Education of IS staff	5	11	12	49	23	pa
Networking	3	9	8	37	43	pa
Quality assurance	1	7	12	45	35	pa

Table 13 represents key IS management issues showing mean (μ) and standard deviation (σ). If the standard deviation is low as in IS Strategic Planning (σ = 1.102), this indicates a tight agreement among respondents, alternatively in Software Development the high standard deviation (σ = 2.022) indicates a loose agreement among respondents. This indicates a wide difference between the respondent's views on the importance of this issue. The three groupings as identified in Table 12, unanimous agreement, probable agreement and ambivalent are supported by looking at the mean and standard deviations in Table 13. The unanimous issues IS Strategic Planning (μ = 7.895,σ = 1.102), IS For Competition (μ = 7.316,σ = 1.122) and IT Infrastructure (μ = 7.171,σ = 1.509) all have high means with low standard deviations. The largest grouping, that of probable agreement, are marked by having mean values in the six range with moderate standard deviations. This group includes: Systems Development, ESS and DSS, BPR, Disaster Recovery, End-User Computing, Security and Control, Education of IS Staff, Networking and Quality Assurance. The final grouping, that of ambivalent, have low mean values and high standard deviations, these include the Integrated Systems (μ=5.822, σ=1.932), Human Resources for IS (μ=5.803, σ=1.973) and Software Development (μ=5.868, σ=2.022).

Table 13: IS Issues by Mean and Standard deviation

Key IS management Issues.	Mean (μ)	SD (σ)
IS strategic planning	7.895	1.102
IS for competition	7.316	1.122
Systems development	6.750	1.576
ESS and DSS	6.184	1.529
BPR	6.421	1.619
Disaster recovery	6.513	1.763
End-user computing	6.316	1.683
IT infrastructure	7.171	1.509
Security and control	6.539	1.587
Integrated systems	5.882	1.932
Human resources for IS	5.803	1.973
Software Development	5.868	2.022
Education of IS staff	6.171	1.792
Networking	6.816	1.764
Quality assurance	6.737	1.535

Table 14 represents the key IS issues according to their rating with issue category and grouping also portrayed. Rating is presented according to the mean (μ) in descending order. Ranking the IS issues and categorising the issues into unanimous agreement, probable agreement and ambivalent will allow us to compare our results with previous surveys as well as exploring why some issues are considered important by everyone yet other issues are not so important.

Table 14: Rating of IS Issues
(N = 76)

Key IS management Issues.	Issue Category	Mean (μ)	SD (σ)	Rating	Groupings
IS strategic planning	B	7.895	1.102	1	ua
IS for competition	B	7.316	1.122	2	ua
IT infrastructure	T	7.171	1.509	3	ua
Networking	T	6.816	1.764	4	pa
Systems development	S	6.750	1.576	5	pa
Quality assurance	T	6.737	1.535	6	pa
Security and control	T	6.539	1.587	7	pa
Disaster recovery	T	6.513	1.763	8	pa
BPR	B	6.421	1.619	9	pa
End-user computing	B	6.316	1.683	10	pa
ESS and DSS	B	6.184	1.529	11	pa
Education of IS staff	H	6.171	1.792	12	pa
Integrated systems	T	5.882	1.932	13	am
Software Development	S	5.868	2.022	14	am
Human resources for IS	H	5.803	1.973	15	am

Note:
ua: Unanimous agreement
pa: Probable agreement
am: Ambivalent

4.4 IS Issues by Industry Grouping

Table 15 shows crosstabulations between key IS issues and the industry group. The industry groups are made up of mining or petroleum (response rate - 20%), services including transport (14%), manufacturing industry (41%). These three industry groups were used because they made up the majority of the respondents within the survey (see Table 5). The issues in Table 15 are represented according to the rating

in Table 14. Upon analysing the mean values two issues, BPR and Software Development may yield significant differences. The issue of BPR is of more importance to manufacturing industry (μ =6.714, σ =1.822) as compared to mining or petroleum industry (μ =5.733, σ =1.830). Software Development is of more importance to the manufacturing industry (μ =6.129, σ =2.183) and services including transport industry (μ =6.214, σ =1.311) than to mining or petroleum industry (μ =4.266, σ =1.940). Further analysis by kruskal-wallis one-way ANOVA shows that there is a clear difference between mining or petroleum and the other two groups in Software Development (p=.0358) and no difference for BPR.

Table 15: IS Issues by Industry Group

(N=76)

	Industry Groups					
	Mining or Petroleum		Services including Transport		Manufacturing Industry	
Key IS Management issues. (Rated in order)	Mean (μ)	SD (σ)	Mean (μ)	SD (σ)	Mean (μ)	SD (σ)
IS strategic planning	7.800	1.140	7.714	1.200	8.064	1.03
IS for competition	7.066	1.120	7.642	.8411	7.419	.992
IT infrastructure	6.600	1.760	7.500	1.163	7.322	1.62
Networking	6.400	1.720	6.928	1.974	6.741	1.91
Systems development	5.933	2.010	6.785	1.211	6.967	1.44
Quality assurance	6.866	1.680	6.785	1.711	6.645	1.40
Security and control	6.733	1.660	7.000	1.466	6.580	1.54
Disaster recovery	6.733	1.750	6.571	1.745	6.677	1.64
BPR	**5.733**	**1.830**	**6.571**	**1.085**	**6.714**	**1.822**
End-user computing	6.333	1.490	5.857	2.214	6.419	1.68
ESS and DSS	5.600	1.500	6.357	1.498	6.322	1.59
Education of IS staff	5.866	2.030	5.785	1.577	6.322	1.95
Integrated systems	5.600	2.060	5.642	2.177	6.193	1.99
Software Development	**4.266**	**1.940**	**6.214**	**1.311**	**6.129**	**2.183**
Human resources for IS	5.333	2.050	5.428	2.024	5.903	1.98

Table 16 presents the rating of the key IS issues according to industry grouping. The column rating gives the overall rating of the issues (See Table 14) and each industry grouping can be compared by looking at their rating. Further analysis is presented in Table 26.

Table 16: Industry Grouping Rating by Key IS Issues Rating

(N=76)

	Industry Groups		
	Mining or Petroleum	Services including Transport	Manufacturing Industry
Key IS Management Issues Rating.	Rating	Rating	Rating
IS strategic planning	1	1	1
IS for competition	2	2	2
IT infrastructure	6	3	3
Networking	7	5	5
Systems development	9	6	4
Quality assurance	3	7	8
Security and control	4	4	9
Disaster recovery	5	8	7
BPR	11	9	6
End-user computing	8	12	10
ESS and DSS	12	10	11
Education of IS staff	10	13	12
Integrated systems	13	14	13
Software Development	15	11	14
Human resources for IS	14	15	15

4.5 IS Issues by IS Department Size

The sample of the survey consisted of large organisations but we see a disparity in the size of IS departments. Modern organisations can structure their IS facilities in many organisational patterns and recent employment trends including outsourcing and downsizing are important determinant factor in the size of IS department. The size could also be affected by the type of industry the organisation is in as well as the size of the organisation. Table 17 presents an exploratory analysis of the difference in importance of IS issues between three types of IS departments; small (<10), moderate (10-50) and large (>50).

Table 17 shows crosstabulation statistics between each key IS issue and three types of IS departments and are presented according to the rating in Table 14. IS Strategic

Planning is the top ranking issue in Table 14 and Table 17 shows it is of more importance to large IS departments ($\mu = 8.09$, $\sigma = 0.92$) than small IS departments ($\mu = 7.55$, $\sigma = 1.21$). On the other hand End-User Computing is more important within small IS departments ($\mu = 6.929$, $\sigma = 1.69$) when compared to large IS departments ($\mu = 6.136$, $\sigma = 1.93$).

Table 17: Information Systems Department Size by the IS Issues

(N=76)

	Size of Information Systems Dept					
	Small (< 10)		Moderate (10 - 50)		Large (> 50)	
Key IS Management issues.	**Mean (μ)**	**SD (σ)**	**Mean (μ)**	**SD (σ)**	**Mean (μ)**	**SD (σ)**
IS strategic planning	**7.555**	**1.211**	**8.074**	**1.071**	**8.092**	**0.922**
IS for competition	7.111	1.055	7.407	1.248	7.454	1.050
IT infrastructure	7.185	1.922	7.111	1.333	7.222	1.150
Networking	6.333	2.077	7.259	1.282	6.863	1.780
Systems development	**6.222**	**1.844**	**6.963**	**1.423**	**7.136**	**1.282**
Quality assurance	6.925	1.439	7.000	1.333	6.181	1.789
Security and control	6.851	1.511	6.518	1.455	6.181	1.818
Disaster recovery	6.703	1.911	6.629	1.333	6.136	2.033
BPR	6.185	1.978	6.703	1.566	6.363	1.294
End-user computing	**6.929**	**1.699**	**6.148**	**1.455**	**6.136**	**1.932**
ESS and DSS	**6.037**	**1.744**	**6.814**	**1.388**	**5.590**	**1.144**
Education of IS staff	5.814	2.275	6.592	1.477	6.096	1.412
Integrated systems	**6.407**	**1.944**	**5.925**	**2.033**	**5.181**	**1.623**
Software Development	5.222	2.432	6.222	1.923	6.227	1.343
Human resources for IS	5.555	2.111	6.000	1.94	5.863	1.888

The issue of Integrated Systems is of more importance to small IS departments ($\mu = 6.407, \sigma = 1.94$) as compared to large IS department ($\mu = 5.181, \sigma = 1.62$). Alternatively the issue Systems Development is of more importance to large IS departments ($\mu = 7.136, \sigma = 1.28$) as compared to small IS departments ($\mu = 6.222, \sigma = 1.84$). ESS & DSS show a difference between medium IS departments ($\mu = 6.814, \sigma = 1.38$) and large departments ($\mu = 5.590, \sigma = 1.14$). Further analysis by Kruskal-Wallis one way ANOVA shows that ESS and DSS was the only key IS issue which had a significant difference ($p = 0.0194$) within the three groups of

respondents. Organisations with moderate (10-50) IS staff tend to find this issue more important as compared to large organisations.

4.6 IS Issues by IS Level

Table 18 shows crosstabulation statistics between IS level and the key IS issues. The IS levels are made up of head of IS (70%) and one level below IS head (16%). Two or more levels below IS head were not considered because these two combined represent only (5%) of the respondents and will not have a significant effect on the result.

Table 18: IS Issues by IS Level

(N=76)

	IS Level in Organisation			
	Head of IS Section		One level below IS Head	
Key IS Management issues.	**Mean (μ)**	**SD (σ)**	**Mean (μ)**	**SD (σ)**
IS strategic planning	7.888	1.122	8.083	0.999
IS for competition	7.283	1.183	7.333	0.888
IT infrastructure	7.266	1.444	7.000	1.755
Networking	6.916	1.693	6.583	2.064
Systems development	**6.888**	**1.611**	**5.583**	**1.677**
Quality assurance	**6.566**	**1.573**	**7.083**	**1.166**
Security and control	6.483	1.544	6.333	1.822
Disaster recovery	6.583	1.782	6.083	1.788
BPR	6.354	2.614	6.755	1.711
End-user computing	6.383	1.644	6.333	1.922
ESS and DSS	6.355	1.395	5.916	1.971
Education of IS staff	6.166	1.855	6.255	1.176
Integrated systems	6.016	1.896	5.166	2.087
Software Development	5.954	1.888	6.083	2.500
Human resources for IS	5.955	1.851	5.755	2.261

The key issues in Table 18 are also presented according to their rating as in Table 14. The issue Systems Development is of more importance to head of IS section (μ=6.8, σ =1.61) than to one level below IS head (μ=5.583, σ =1.67). Alternatively the issue Quality Assurance is of less importance to head of IS (μ=6.566, σ =1.57) than to one level below IS head (μ = 7.083, σ = 1.16). Further analysis as shown by

Kruskal-Wallis one way ANOVA tests reveal there is no difference in ranking of key IS issues between the head of IS and the respondent one level below the head.

4.7 Respondent Initiated Key Issues

Respondent initiated key issues show the responses given by survey participants when asked to fill in open ended questions of their views of new developing key issues. The responses have been divided into two categories; new issues, and old issues. The need to provide categories is due to what seems to be a misunderstanding among the respondents about this question. Several respondents repeated key issues out the main survey in the open ended questions. They may have been providing an additional ranking of issues within the open ended question section. Table 19 represents the new key issues that are provided by the respondents. Several issues were mentioned more than once: Managing IT Cost (5), Year 2000 Problem (3), Aligning IT to business now/future (3) and Customer Service (3). These issues may become possible items in future surveys. The new issues are presented in their entirety and no attempt was made to re-categorise them.

Table 19: Respondent Initiated New Key Issues

Proposed Key IS Issues	No of Mentions
Managing IT cost	5
Year 2000 problem	3
Aligning IT to business now/future	3
Customer service	3
Supporting the newly implemented systems	2
Technology rapid advances	1
Completing implementing of replacement business systems	1
Rewarding staff based on performance measures	1
Seamlessly integrating all applications	1
Migration to SAP	1
Change management	1
On going Change	1
Manage implementation project to replace every transactional system in two companies with one package	1

Understand how legal products can be most effectively implemented in our client organisations	1
Contribution to the business	1
Integration of facilities and information	1
Reliability of systems	1
Value IT adds to the business	1
Politics internationally affecting integration	1
Response time to new application development.	1
Roles and Responsibilities	1
Installing Lotus Domain/notes	1
Defining user needs/select enterprise package	1
Supporting a Global business	1
Extending the enterprises reach	1
Supporting Reorganisation	1
Supporting organisational learning	1
Extracting Economics of Scale	1
System Integration	1
Adapt/Implement technology to compete	1
Integrate with business planning process	1
Delivery of solutions in shorter time frame	1
Combine introduction of new technology and maintain existing systems	1
Building an Intranet	1

Table 20 shows the key issues which were repeated by the respondents. An additional reason why so many respondents have repeated the survey's key issues is that they might consider these important.

Table 20: Respondent Initiated Repeated Key Issues

Proposed Key IS Issues	No of Mentions
IS Strategic Planning	16
Creating Responsive IT Infrastructure	11
Competitive Advantage	9
Integrating networks structure	8
BPR	7
User/Executive development	5
Plan/Implement/Manage systems development	5
Improving Software Quality	4
Disaster recovery	4
Supporting end-user computing	3
DSS	3

Specifying recruiting human resources	3
Improve data integrity and quality Assurance	2
Improve security and control	2
Security	1
WAN & integration	1
IT staff development	1
Software development life cycle	1
Paperless office (Office automation)	1

Conclusion

This chapter gave a detailed account of the statistical analysis conducted as part of the research and showed how the survey was used to identify key IS issues. The first section included a description of respondent demographics. The second shows how the key issues were ranked and grouped into three categories. post-hoc analysis was performed to determine if industry group, IS department size, and IS level have an impact upon the key issues (refer to Appendix E). The third section described respondent initiated new IS issues. The final chapter presents an interpretation of results.

5. Interpretation of the Results

Synopsis

This chapter presents an interpretation of the results as described in Chapter 4. This chapter is divided into four parts, each relating to the four research questions. The first part describes the key IS issues and also provides an explanation of why some issues are more important than others. The second part compares the key IS issue findings with previous Australian and international studies and also provides a description of the differences between these studies. The third part discusses new emerging trends in key IS issues. The final part describes any effect that industry grouping, IS respondent level, and IS department size have on the key IS issues rating.

5.1 Key Australian IS issues

The purpose of the first research question was to ascertain the key IS issues in the Australian business environment and rank them from most important to least important.

RQ1: *What are the key issues in information systems management in the Australian Business environment.*

The key IS issues (Table 21) in the study are a mixture of business, technological, systems development and human resources issues. This clearly indicates the need for a balance between business, technical, systems development and human resources knowledge among IS professionals.

Table 21: Grouping of IS Issues
(N = 76)

Key IS management Issues.	Issue Category	Rating	Groupings
IS strategic planning	B	1	ua
IS for competition	B	2	ua
IT infrastructure	T	3	ua
Networking	T	4	pa
Systems development	S	5	pa
Quality assurance	T	6	pa
Security and control	T	7	pa
Disaster recovery	T	8	pa
BPR	B	9	pa
End-user computing	B	10	pa
ESS and DSS	B	11	pa
Education of IS staff	H	12	pa
Integrated systems	T	13	am
Software Development	S	14	am
Human resources for IS	H	15	am

Among the respondents it is clear that the business issues (IS Strategic Planning, IS for Competition) are of more importance than other issues. This can be explained by the competitive nature of the business world and with IS professionals seeing information systems giving their organisation a business edge over their competitors. On the other hand human resources issues (Human Resources for IS, Education of IS Staff) are in the bottom group of issues. The reason for this may relate to the growing trends of outsourcing and contracting of IS personal. These practices obviate the need for organisations to develop human resource processes and policies for IS staff. An example would be the low priority given to training in new packages for IS staff. When a new package is adopted an organisation may outsource or contract new personnel to utilise the package. This need to outsource for IS skills is outlined by Baker (1997). This area is worthy of further study as there is an inherent contradiction in the rating of these issues. Information systems are developed and implemented by IS staff yet the respondents seem to place a low level of importance in enhancing the skills of these IS personnel. The impact of outsourcing upon business performance as well as IS staff morale would be subjects worthy of study.

5.2 IS Issues - Comparison

Research Question Two compared previous Australian and international studies with the results from this survey.

RQ2: *How do these key issues compare with international and previous Australian studies.*

5.2.1 Key IS issues - Australian Comparison

In Table 22 the issues have been divided into four categories, issues generally staying the same, issues increasing in importance, issues decreasing in importance and those issues where no trends was discernible.

Table 22: Key IS issues (1997) by Previous Australian Issues

Key IS management Issues.	Issue Category	Rating 1997	Rating** Pervan (1997)	Rating* Pervan (1993)	Trend
IS strategic planning	B	1	6	1	same
IS for competition	B	2	4	5	increase
IT infrastructure	T	3	1	2	same
Networking	T	4	5	15	increase
Systems development	S	5	31	25	increase
Quality assurance	T	6	19	7	no trend
Security and control	T	7	11	19	increase
Disaster recovery	T	8	8	10	same
BPR	B	9	18	NI	increase
End-user computing	B	10	9	11	same
ESS and DSS	B	11	14	13	same
Education of IS staff	H	12	3	12	no trend
Integrated systems	T	13	20	20	increase
Software Development	S	14	22	8	decrease
Human resources for IS	H	15	17	17	same

Note:
*** Rating from Pervan (1993) Mean Importance.**
**** Rating from Pervan (1997) Mean Importance.**
NI: Indicates not included in the survey.

Analysing the ratings issues were ratings trended up were classified as increasing in importance. Similarly issues where rating trended down were classified as decreasing in importance.

Issues that generally stayed the same in importance included, IS Strategic Planning, IT Infrastructure, Disaster Recovery, End-User Computing, ESS and DSS and Human Resources for IS. Issues that increased in importance to IS professionals included, IS for Competition, Networking, Systems Development, Security and Control, BPR and Integrated Systems. The increase in importance of Networking, Systems Development, Security and Control and Integrated Systems may be understood in terms of the development and improvement in technologies that guide these issues. The basis for this study was the rapid technological development that IS professionals must cope with and these issues are all heavily impacted by the advancement in internet and potential electronic commerce technologies. The issue that decreased in importance to IS professionals was Software Development. One reason for this may be that more and more organisations are using off the shelf software rather than software built from the ground up. Contracting out or outsourcing the software development process may also be a reason why this issue has decreased in importance. Issues that fail to show any trend include Quality Assurance and Education for IS Staff.

5.2.2 IS Issues - International Comparison

It was very difficult to compare Australian issues with previous international studies. The reason for this was the lack of uniformity among the issues selected for the survey in different countries. If a true comparison is to be made between the key IS issues among different countries then perhaps there has to be a uniform set of key IS issues. This might not be possible because of the different state of the IS environment in different countries. Another problem in comparing the international studies relates to the time frame of the surveys. In the IS field technology has a very short life span and IS issues can be born and lapse within the period of several years. Ideally an international study could gather views and would thereby provide a snap shot of IS issues across the globe. The IS study by Niederman et al is from 1991, a period when the Year 2000 problem, the extensive use of the internet, and the potential of electronic commerce were unheard of concepts. Table 23 attempts to summarise the differences in ranking between the key IS issues from eight international surveys and the current Australian one.

Table 23: Key IS Issues (1997) by International Issues

Key IS management Issues.	Rating AUS (1997)	Rating Canada (1996) Pollard	Rating Korea (1995) Kim	Rating US (1995) Lee	Rating US (1994-95) Brancheau	Rating Hong Kong (1993) Burn	Rating UK (1993) Galliers	Rating Europe (1993) CSC	Rating US (1991) Niederman	Trends
IS strategic planning	1	11	6	14	10	2	1	12	3	same
IS for competition	2	8	4	NI	17	8	7	NI	8	same
IT infrastructure	3	1	1	NI	1	NI	NI	NI	6	same
Networking	4	3	3	15	5	9	NI	NI	10	no trend
Systems development	5	21	NI	3	NI	4	NI	11	16	same
Quality assurance	6	15	NI	NI	7	10	2	17	2	decrease
Security and control	7	NI	NI	13	NI	NI	6	NI	19	same
Disaster recovery	8	NI	NI	NI	NI	NI	NI	NI	20	no trend
BPR	9	9	2	NI	2	NI	3	1	NI	decrease
End-user computing	10	16	8	16	16	6	8	NI	18	no trend
ESS and DSS	11	NI	NI	NI	NI	NI	18	NI	17	increase
Education of IS staff	12	14	13	12	14	NI	8	14	5	same
Integrated systems	13	17	10	21	NI	10	NI	7	12	same
Software Development	14	4	12	19	6	7	4	NI	9	decrease
Human resources for IS	15	12	11	NI	8	1	NI	6	4	decrease

Note:
NI: Indicates not included in the survey.

Analysing the ratings issues were ratings trended up were classified as increasing in importance. Similarly issues where rating trended down were classified as decreasing in importance. The comparison between Australian and international key IS issues was conducted on the same basis as the comparison between different Australian studies. The categories included, generally stayed the same, increased in importance, decreased in importance and those issues where there was discernible trend.

Issues that generally stayed the same importance to IS professionals included, IS Strategic Planning, IS for Competition, IT Infrastructure, Systems Development, Security and Control, Education for IS Staff, Integrated Systems. ESS and DSS was the only issue that increased in importance to IS professionals. Issues that decreased in importance to IS professionals included; Quality Assurance, BPR, Software Development, Human Resources for IS. Issues that failed to show any trend in importance included; End-user Computing, Networking, and Disaster Recovery.

5.3 Key IS Issues - New Trends

Research Question Three explored any emerging trends in IS management issues. This was conducted by asking participants to include any new issues which they considered important and were not included in the survey. Table 24 contains only those issues that are repeated more that twice by the respondents, for the complete table of respondent initiated key IS issues see Table 19.

RQ3: *Are there any emerging information systems issues?*

Table 24: Repeated Respondent Initiated New Key IS Issues

Proposed Key IS Issues	New Issues	No of Mentions
Managing IT cost	New Issue	5
Year 2000 problem	New Issue	3
Aligning IT to business now/future	New Issue	3
Customer service	New Issue	3

Managing IT costs was considered important by five respondents and could be due to the growing number of PCs (Personnel computers) or Network PCs in organisations. Advances in networking in modern organisations and the advent of rapidly changing IT technology have escalated the costs of running IS departments as described in Emma (1996).

The prospect of disabled computer systems and paralysed enterprises make the year 2000 problem one of the most significant and universal challenges ever faced by the IT industry. Solving the problem by rewriting date sensitive software to recognise the new millennium or replacing it will cost an astonishing amount, in excess of billions of dollars (Hayward 1997). This issue should be elevated to key status in the immediate short term future.

The alignment issue was considered important by three respondents and could be due to the rapid advances in IT industry with the business sector needing to align IT so that they can take full commercial advantage and be competitive (McLean et al 1996).

Customer service was mentioned by three respondents. Gone are the days when computers were expensive toys to be used only by selected personnel and the internal IT department was not affected by (Pitt et al 1995) competition and customer service issues. Due to the ease of computer use and drastically reduced computer prices, computer usage has increased enormously. There is now a need for IT departments to understand the need to be "a business within a business" and meet the demand for better customer service (Stern & Stern 1993). Again internal IT departments are facing competition from outsourced IT companies.

5.4 IS Issues by Industry Group, IS Staff Level and Department Size

Research Question Four determined any possible effect that Industry group, IS professional level or IS department size had on key IS issues. This was conducted by exploring crosstabulations of key IS issues with IS factors (group, level, size) and then by completing post-hoc ANOVA analysis.

RQ4: *Does Industry group, IS respondent level or IS department size effect the perception of key IS issues?*

5.4.1 IS Issues by Industry Groups

Table 25 clearly shows there are two issues that may demonstrate significant differences between the three industry groups under investigation. The issue of BPR is of more importance to manufacturing industry (μ =6.714, σ =1.822) as compared to mining or petroleum industry (μ =5.733, σ =1.830). This may mean that manufacturing industry sees a need for reorganisation within their business process in order to stay competitive. This compares to the mining & petroleum industry where patterns of work and business processes do not change rapidly.

The kruskal-wallis one-way ANOVA shows that there was a significant difference between mining or petroleum and the other two groups in Software Development (p=. 0358). Software Development is of more importance to the manufacturing industry (μ =6.129, σ =2.183) and services including transport industry (μ =6.214, σ =1.311) than to mining or petroleum industry (μ =4.266, σ =1.940). This may be the case because manufacturing industry and services including transport are more involved in software development process than the mining or petroleum industry.

Table 25: Selected IS Issues by Industry Group

	Industry Groups					
	Mining or Petroleum		Services including Transport		Manufacturing Industry	
Key IS Management issues.	Mean (μ)	SD (σ)	Mean (μ)	SD (σ)	Mean (μ)	SD (σ)
BPR	5.733	1.830	6.571	1.085	6.714	1.822
Software Development	4.266	1.940	6.214	1.311	6.129	2.183

Table 26 shows difference in the key IS issue rating based on the industry grouping and the difference of each industry rating when compared with the overall survey rating is presented as a +/- deviation (Dev). The top two issues in Table 14 are also the top two ranked issues of the three investigated industry groups. IT Infrastructure (+3) was not considered as important by mining or petroleum. This may be the case because these industries are not solely driven by or mainly dependent on IT, the IT department may be only considered a support area for enhancing the organisations performance.

On the other hand Quality Assurance (-3) is of more importance to mining or petroleum industry than the other two industry groups. This may be because the mining or petroleum industry have to follow safety critical software applications and work according to rules and regulations to a greater extent than the other two industry groups.

Security and Control (-3) was considered more important by mining or petroleum and services (-3) including transport rather than the manufacturing industry (+2). This may be the case because mining or petroleum and services including transport deal with more critical data than the manufacturing industry. Key IS issues rating from 10 to 15 have generally the same rating in the three industry groups under investigation.

Table 26: Industry Grouping Rating by Key IS Issues Rating

Key IS Management Issues	Rating Table 14	Industry Groups: Mining or Petroleum Rating	Mining or Petroleum Dev	Services including Transport Rating	Services including Transport Dev	Manufacturing Industry Rating	Manufacturing Industry Dev
IS strategic planning	1	1	0	1	0	1	0
IS for competition	2	2	0	2	0	2	0
IT infrastructure	3	6	+3	3	0	3	0
Networking	4	7	+3	5	+1	5	+1
Systems development	5	9	+4	6	+1	4	-1
Quality assurance	6	3	-3	7	+1	8	+2
Security and control	7	4	-3	4	-3	9	+2
Disaster recovery	8	5	-3	8	0	7	-1
BPR	9	11	+2	9	0	6	-3
End-user computing	10	8	-2	12	+2	10	0
ESS and DSS	11	12	+1	10	-1	11	0
Education of IS staff	12	10	-2	13	+1	12	0
Integrated systems	13	13	0	14	+1	13	0
Software Development	14	15	+1	11	-3	14	0
Human resources for IS	15	14	-1	15	0	15	0

5.5.2 IS Issues by IS Department Size

Table 27 presents the crosstabulation statistics between each key IS issue and department size. IS Strategic Planning is the top ranking issue in Table 14. Table 27 shows it is of more importance to large IS departments ($\mu = 8.092$, $\sigma = 0.922$) and of less importance to small IS department ($\mu = 7.555$, $\sigma = 1.211$). This shows that organisations with large IS departments staff have a greater emphasis on using IS for strategic advantage as compared to small organisations. On the other hand End-User Computing is more important within small IS departments ($\mu = 6.929$, $\sigma = 1.699$) when compared to large IS departments ($\mu = 6.136$, $\sigma = 1.932$). This may mean that small

organisations with less IS staff have a greater emphasis upon developing and training end-users to be more computer literate. ESS & DSS show a difference between medium IS departments ($\mu = 6.814, \sigma = 1.388$) and large departments ($\mu = 5.590, \sigma = 1.144$).

Table 27: Selected IS Issues by Department Size

	Size of Information Systems Department					
	Small (< 10)		Moderate (10 - 50)		Large (> 50)	
Key IS Management issues.	Mean (μ)	SD (σ)	Mean (μ)	SD (σ)	Mean (μ)	SD (σ)
IS strategic planning	7.555	1.211	8.074	1.071	8.092	0.922
Systems development	6.222	1.844	6.963	1.423	7.136	1.282
End-user computing	6.929	1.699	6.148	1.455	6.136	1.932
ESS and DSS	6.037	1.744	6.814	1.388	5.590	1.144
Integrated systems	6.407	1.944	5.925	2.033	5.181	1.623

The issue of Integrated Systems is of more importance to small IS departments ($\mu = 6.407, \sigma = 1.943$) as compared to large IS department ($\mu = 5.181, \sigma = 1.623$). This may be due to small IS departments having greater emphasis on systems integration and office automation due to the lack of resources. The large IS department may have specialists to perform these roles whereas the small IS department needs to emphasise the importance of system integration. Alternatively the issue Systems Development is of more importance to large IS departments as compared to small IS departments. This could be due to large IS department being more involved in Systems Development process with small IS departments more involved with the management of outsourcing the development process. These issues could form the basis for further study. Whilst the Post Hoc one way ANOVA showed that ESS & DSS was the only issue that showed significant differences between different IS departments further study could be undertaken to monitor the effect that changing department configurations have upon key issues importance.

5.5.3 IS Issues by Staff Level

Table 28 provides crosstabulation statistics between IS level and the key IS issues.

Table 28: Selected IS Issues by IS Level

(N=76)

	IS Level in Organisation			
	Head of IS Section		One level below IS Head	
Key IS Management issues.	Mean (μ)	SD (σ)	Mean (μ)	SD (σ)
Systems development	6.888	1.611	5.583	1.677
Quality assurance	6.566	1.573	7.083	1.166

The key issues in Table28 are also represented according to the rating as in Table 14. The issue Systems Development is of more importance to head of IS section ($\mu = 6.888$, $\sigma = 1.611$) than to one level below IS head ($\mu = 5.583$, $\sigma = 1.677$). This could be due to the fact that one of the primary responsibilities of the head of IS section is to plan and manage systems development. Alternatively the issue Quality Assurance is of less importance to Head of IS ($\mu = 6.566$, $\sigma = 1.572$) than to one level below IS head ($\mu = 7.083$, $\sigma = 1.161$). The ANOVA test shows no significant difference between head of IS and the respondent one level below head.

5.5 Limitation of the study

The limitations that apply to other methodologies were discussed in detail in Chapter 3. This research employed the survey questionnaire methodology. As in any mail survey, there was a problem of response bias. The usual technique for dealing with this issue is to perform a follow-up mailing to non-respondents to persuade them to complete the survey. Time and cost constraints precluded this as viable option.

There was no assurance that returned surveys were completed by IS professionals. This lack of control could have been avoided by conducting personal interviews, but this would have been at the cost of drastically reducing the size of the sample and drastically increasing the expense of the study. As was discussed at the outset, this was not a practical option.

It is important to note that this study is not intended to capture the entire range of perspectives on key issues in information systems management. The views expressed here are heavily influenced by the research sample questionnaire. Thus the study does not necessarily represent emerging roles of IS professional in other business functions such as marketing, finance and operations where using information technology may be of importance. It is clear from Table 5 that the study does not represent small business.

When comparing the results from this survey with other Australian and international surveys two limitations arise. Firstly, the time frame of the previous surveys limits their usefulness when comparing results between countries. Secondly, every survey has a floating group of IS issues. Previous research by Brancheu (1994-95) consisted of Delphi studies to ascertain lists of IS issues. There will be a constant evolution of IS issues and future surveys will require a process for ascertaining developing issues.

5.6 Conclusion and Further Research

Information systems are developing constantly and evolving due to technical and business imperatives. Chapter 2 presented a picture of these evolving information systems and presented the framework for the development of the key IS issues used in this study.

The purpose of this study was to indicate to IS professionals the problems that their colleagues are facing and to alert those who serve the IS community as to where they

should be directing their resources. This study has presented some results of key issues facing IS professionals in Australia's largest organisations.

According to the grouping in chapter 4, IS Strategic Planning, IS for Competition and IT Infrastructure are the most critical issues faced by Australian IS professionals. On the other hand Integrated Systems, Software Development and Human Resources for IS are the least important issues. It is possible to develop three groupings of issues, those that all respondents thought important, those that most respondents thought important and those that were somewhat ambivalent. The business issues, IS Strategy and IS for Competition, headed the list of crucial issues. The two human resource issues, Human Resources and Education for IS Staff, were amongst the least important. When comparing issues with previous Australian surveys most issues were either more important or about the same rating. Software Development was the only issue that decreased in importance from previous Australian surveys.

The increasing globalisation of IS and the business market place creates the need for international comparisons of IS issues. Global communications networks could be used to augment such studies.

New issues that emerged from this study were: managing IT cost, year 2000 problem, aligning IT to business now and in the future and customer service considerations.

There was a discernible difference in the rating of issues by different industry groupings. Further research probing the differences between industry groupings could provide the basis for future surveys. Several issues were rated differently by small, medium and large IS departments. The outsourcing phenomenon and its role in managing systems development, training and other IS issues could be the basis for future study in this area.

There was no difference between the rating of issues by the head of IS and the person one level below. This may show a consistency of approach to issues within the IS department.

This report has sought to explore the ongoing development of IS issues within the Australian business environment. The results should form the basis for future study into the changing face of business information systems.

Bibliography

Ahituv, N., Neumann, S. & Riley, H. N., 1994, *Principles of Information Systems for Management*. 4th Ed., Brown, Dubuque, Ia.

Alter, S., 1996, *Information systems: A Management Perspective,* Addison-Wesley, Reading, Mass.

Angell, I. O. & Smithson, S., 1991, *Information Systems Management: Opportunities and Risks.,* Macmillan, Basington.

Avision, D. E. & Taylor, A. V., 1996, 'Information systems development methodologies: a classification according to problem situations', *Journal of Information Technology,* vol.11(2).

Baker, G., 1997, 'The soldiers have come to stay', *The Age,* November, pp. 11-16

Barker, C., 1997, 'Training', *Information Age,* October.

Bell, G., 1992, *Rapid Information Systems Development*, McGraw-Hill, New York.

Bob, B., 1997, 'Poll: Tech People Scarce', *CMP Media Inc,* Issue. 957, June, pp. 1-2.

Boyton, A. C. & Zmud, R. W., 1987, 'Information Technology planning in the 1990's: directions for practice and research', *MIS Quarterly*, vol.11(1), November, pp. 59-72.

Brancheau, J. C., Wetherbe, J. C. & Janz, D.B., 1996, 'Key Issues in Information Systems Management: 1994-95', *MIS Quarterly*, vol. 20, June, pp. 225-242.

Broadbent, M. & Weill, P., 1997, 'Management by Maxim: How Business and IT Managers Can Create IT Infrastructures', *Sloan Management Review*, Spring, pp. 77-92.

Buckinghman, R.A., Hirschheim, R.A., Land, F. F. & Tully, C.J., 1987, *Information systems curriculum: a basis for course design*, Cambridge Press, Cambridge.

Burn, J., Saxena, K.B.C., Ma, L. & Cheung, H. K., 1993, 'Critical Issues of IS Management in Hong Kong: A Cultural Comparison', *Journal of Global Information Management*, September, pp. 28-37.

Butler, J., 1992, ' How to stay in Business when Disaster Strikes', *Software Magazine*, August.

Cats-Baril, W., & Thompson, R., 1997, *Information Technology and Management*, Irwin Book Team, Boston, USA.

Chernicoff, D. P., 1993, 'Wired for the future', *PC Week*, vol.10, March, pp. 49-51.

Coakes, J., & Steed, G., 1996, *SPSS for Windows*, John Wiley & Sons, Brisbane.

Cohen, J., 1969, *Statistical Power Analysis for the Behavioural Sciences*, Academic Press, New York.

CSC Index., 1993, 'Critical Issues of Information Systems Management for 1993', *The Sixth Annual Survey of I/S management Issues,* CSC Index.

Datamation., 1994, 'What is a Strategic Information System?', *Datamation*, January.

Daly, M., 1994, 'An EIS of Epic Proportions', *MIS*, March, pp. 47-49.

Daneshgar, F., 1993, 'How to Integrate an EIS', *MIS*, March, pp. 41-46.

Davenport, T.H., 1993, *Process Innovation: Reengineering Work through Information Technology*, Harvard Business School Press, Boston, Massachusetts.

David, W., 1996, 'Training for the New Millennium', *Computerworld,* June, pp. 42-46.

Davis, S. A. & Bostrum, R. P., 1993, 'Training End-users: An experimental investigation of the computer interface and training methods', *MIS Quarterly*, vol. 17(1), March, pp. 61-85.

Deans, P. C. & Kane, M. J., 1992, *International Dimensions of Information systems and Technology*, PNS-Kent Publishing Co, New York.

Diane, W., 1996, 'Tech Advances Raise Disaster Recovery Stakes', *Property & Casualty/Risk & Benefits Management*, February, pp. 5-6.

Eckerson, W., 1990, 'Changing users needs driving outsourcing', *Network World*, July, pp.1-47.

Emma, C., 1996, 'Discovering the cost of IT', *MIS*, April, pp.76-81.

Farwell, D., Kuramoto, L., Lee, D.M.S., Trauth, E. & Winslow, C., 1992, 'A new Paradigm for MIS: Implications for IS Professionals', *Information Systems Management.*

Freund, M., 1990, 'The Cost of not Investing in New Technology', *Financial Executive*, November/December, pp. 55-59.

Fried, L., 1995, *Managing Information Technology in Turbulent Times*, John Wiley & Sons Inc, New York.

Fitzgerald, G. & Avision, D.E., 1995, *Information Systems Development: Methodologies, Technologies and Tools*, McGraw-Hill, London.

Gillies, A.C., 1992, *Software Quality Theory and Management,* 1st Ed, Chapman and Hall, London.

Galliers, R. D., Merali, Y. & Spearing, L., 1993, 'Coping with Information Technology? How British Executives Perceive the Key Information Systems Management Issues in the mid-1990s', *Journal of Information Technology*, vol. 9, pp. 223-238.

Galliers, R.D. & Baker, B.S.H., 1994, *Strategic Information Management*, Butterworth-Heinemann Ltd, London.

Guimaraes, T., 1996, 'Assessing the Impact of Information Centers on End-user Computing and Company Performance', *Information Resources Management Journal*, Winter, pp. 6-15.

Hall, R. H., 1987, *Organisation: Structures, Processes and Outcomes*, 4th edition, Prentice-Hall, Englewood Cliffs, NJ.

Hamell, G., 1996, 'Strategy as Revolution', *Harvard Business Review*, vol.74, July-August, pp. 69-82.

Hammer, M. & Champy, J., 1993, *Reengineering the Corporation*, Brealey Publishing, London.

Hammer, M., 1990, 'Reengineering work: Don't Automate, Obliterate', *Harvard Business Review*, July-August , pp. 104-112.

Harvey, G., 1994, ' Making the Information Work', *Business Quarterly*, Spring.

Hayward, B., 1997, 'Technology's top 10 trends', *MIS supplement*, October, pp. 7-15.

Hicks, J., 1993, *Management Information Systems: A user perspective*, 3rd Ed, West Publishing Company, Minneapolis.

Hinton, N., 1992, *Networked Business Solutions: A Management Approach*, McGraw-Hill Book Company, London.

Howard, W. M., 1989, 'Quality Software: The Future of Information Technology', *Journal of Systems Management*, December, pp. 8-14.

Hunt, V. D., 1993, *Managing for Quality*, Business One Irwin, Homewood, IL.

Ives, B. & Jarvenpaa, Sirkka, L., 1991, 'Applications of Global Information Technology: Key Issues for Management', *MIS Quarterly,* vol.15(1), March, pp. 33-49.

ISO., 1986, 'ISO 8042', *Quality Vocabulary*, ISO.

Joseph, M., 1997, 'IS schools: Need Improvement', *Computerworld*, February, pp. 1-6.

Keen, P. G. W., 1988, 'Roles and Skills for the IS Organisation', in *Transforming the IS Organisation*, ICIT Press, Washington, DC.

Kim, H. & Kim, J., 1995, 'Information Systems Management Issues for Korea', *Proceedings of the 1995 Korean MIS Conference.*

Kitchenham, B., 1989, 'Software metrics', in *Software Reliability Handbook*, Ed by Rook. P, Elsevier.

Knoll, A. P., 1986, 'Disaster Recovery: An Organisation View', *IBM Information Systems Management Institute.*

Lee, D., Trauth, E.M., & Farwell, D., 1995, 'Critical Skills and Knowledge Requirements of IS Professionals: A Joint Academic Industry Investigation', MIS Quarterly, vol.19 (3), September, pp.313-340.

Liebenau, J. & Backpush, J., 1990, *Understanding Information: An Introduction*, Macmillan, Basingstoke.

Loch, K. D., 1992, 'Threats to Information Systems: Today's Reality, Yesterday's Understanding', *MIS Quarterly*, vol 16 (2), June, pp. 173-186.

Maglitta, J., 1993, 'Hard skills for Hard Times', *Computerworld.*

McLean, E., Turban, E. & Wetherbe, J., 1996, *Information Technology for Management: Improving Quality and Productivity*, John Wiley & Sons Inc, New York.

Mirani, R. & King, W. R., 1994, 'Impacts of End-users and Information Center Characteristics on End-user Computing Support', *Journal of Management Information Systems*, vol. 11. No.1.

Moyniham. N., 1993, *Business Management and Systems Analysis*, McGraw-Hill, New York.

Neumann, S., 1994, *Strategic Information Systems-Competition through Information Technology*, Macmillan, New York.

Niederman, F., Brancheau, J. C. & Wetherbe, J. C., 1991, 'Information Systems Management Issues for the 1990s', *MIS Quarterly*, vol. 15, pp. 474-500.

O'Brien, James, A., 1985, *Computer in Business Management: an Introduction,* 4th Ed, Irwin Publishing Inc, Homewood, Ill.

OED, 1990, *The Concise Oxford English Dictionary*, 9th Ed, Oxford University Press, Oxford.

Pervan, G. P., 1993, 'Results from a Study of Key Issues in Australian IS Management', *Proceedings of the 4th Australian Conference on Information Systems*, September, pp. 113-128.

Pervan, G. P., 1996, 'Results from a Study of Key Issues in Australian IS Management', *Proceedings of the 7th Australian Conference on Information Systems*, pp. 509-520.

Pervan, G. P., 1997, 'Information Systems Management- An Australian view of Key Issues', *Australian Journal of Information Systems*, (under review).

Pitt, L. F., Watson, R. T., & Kavan, C. B., 1995, ' Service Quality: A measure of Information Systems Effecetiveness', *MIS Quarterly*, vol. 19(2), pp. 173-187.

Pollard, C. & Hayne, S., 1996, 'A Comparative analysis of Information systems Issues Facing Canadian Business', *Hawaii International Conference on System Sciences.*

Port, O., Gross, N., Hof, R. & McWilliam, G., 1994, 'Wonder chips', *Business week.*

Porter, M. E. & Millar, V. E., 1985, 'How Information Gives you Competitive Advantage', *Harvard Business Review*, July-August, pp 149-160.

Richard, P., 1997, 'A Good staff is Hard to Find and Keep', *CIO Magazine*, April, pp. 1-7.

Rivka, T., 1997, 'Wanted: Technical Talent', *CMP Media Inc*, Issue. 666, June, pp. 1-3.

Robert, R. & Kane, S., 1989, *Computer Security*, NC: Computer Book Publishers, Greensboro.

Rockart, J.F., & Treacy, M., 1988, *Executive Support Systems*, Dow-Jones Irwin, Homewood, Ill.

Rowe, S. H., 1991, *Business Telecommunications*, Macmillan, New York.

Scott-Morton, M., 1991, *The Corporation of the 1990s*, MIT, Management in the 1990s Research Program, MIT.

Shawn, S., 1990, 'Quality Software is worth the Strain', *Canadian Datasystems*, pp. 40-41.

Stern, N. & Stern, R., 1993, *Computing in the Information Age*, John Wiley & Sons, Inc, New York.

Schultheis, Robert, & Sumner, Mary, 1995, *Management Information Systems: the Managers View*, 3rd Ed, Von Hoffmann Press, Inc, USA.

Torgerson, W. S., 1958, *Theory and Methods of Scaling*, Wiley Publishing, New York.

Turban, E., 1990, *Decision Support and Expert Systems*, MacMillan Publishing Co., New York, NY.

Villamil-Casanova, J. & Molina, L., 1996, *An Interactive Guide to Multimedia,* Que Education & Training, Indianapolis, USA

Wetherbe, J. C. & Leitheiser, R. L., 1986, 'Servicing Support Levels: An Organisational Approach to End-User Computing', *MIS Quarterly*, vol. 10(4), December, pp. 337-349.

Wilhelm, J., 1987, 'Organsiational Structure of MIS', *MBA paper*, Loyola College, Md.

Worthington, T., 1997, 'The Global Information Economy 1997-The Way Ahead', Journal of *Australian Computer Society,* vol. 1, August, pp. 1-3.

Zikmund, G. W., 1991, *Exploring Market Research*, 2nd Ed, The Dryden Press.

Appendix A: IS Dept Size by Issues

IS Dept Size by IS issues.

Table A.1: IS Dept Size by BPR.

IS Dept Size	Least Important (%)	Not Important (%)	Neutral (%)	Important (%)	Most Important (%)
Less than 10	4.0	15.0	19.0	36.0	26.0
Between 10-50	0.0	11.0	11.0	41.0	37.0
Greater than 50	0.0	5.0	27.0	50.0	18.0

Table A.2: IS Dept Size by Competitive Advantage

IS Dept Size	Least Important (%)	Not Important (%)	Neutral (%)	Important (%)	Most Important (%)
Less than 10	0.0	0.0	11.0	48.0	41.0
Between 10-50	0.0	4.0	7.0	34.0	55.0
Greater than 50	0.0	0.0	0.0	49.0	51.0

Table A.3: IS Dept Size by Improving Data Integrity And Quality Assurance.

IS Dept Size	Least Important (%)	Not Important (%)	Neutral (%)	Important (%)	Most Important (%)
Less than 10	0.0	4.0	15.0	37.0	44.0
Between 10-50	0.0	4.0	11.0	45.0	40.0
Greater than 50	4.0	13.0	10.0	55.0	18.0

Table A.4: IS Dept Size by Plan/Implement/Manage Systems Development.

IS Dept Size	Least Important (%)	Not Important (%)	Neutral (%)	Important (%)	Most Important (%)
Less than 10	0.0	22.0	11.0	30.0	37.0
Between 10-50	0.0	8.0	8.0	44.0	40.0
Greater than 50	0.0	0.0	14.0	41.0	45.0

Table A.5: IS Dept Size by Disaster Recovery.

IS Dept Size	Least Important (%)	Not Important (%)	Neutral (%)	Important (%)	Most Important (%)
Less than 10	0.0	15.0	11.0	29.0	37.0
Between 10-50	0.0	0.0	26.0	47.0	27.0
Greater than 50	5.0	13.0	18.0	41.0	23.0

Table A.6: IS Dept Size by Facilitating/ Managing ESS And DSS.

IS Dept Size	Least Important (%)	Not Important (%)	Neutral (%)	Important (%)	Most Important (%)
Less than 10	0.0	22.0	19.0	33.0	26.0
Between 10-50	0.0	4.0	15.0	52.0	29.0
Greater than 50	0.0	13.0	37.0	50.0	0.0

Table A.7: IS Dept Size by Support End-User Computing.

IS Dept Size	Least Important (%)	Not Important (%)	Neutral (%)	Important (%)	Most Important (%)
Less than 10	0.0	15.0	7.0	48.0	30.0
Between 10-50	0.0	18.0	4.0	63.0	15.0
Greater than 50	5.0	14.0	14.0	41.0	26.0

Table A.8: IS Dept Size by Specifying, Recruiting And Developing Human Resources For IS.

IS Dept Size	Least Important (%)	Not Important (%)	Neutral (%)	Important (%)	Most Important (%)
Less than 10	15.0	15.0	7.0	48.0	15.0
Between 10-50	0.0	25.0	8.0	41.0	26.0
Greater than 50	5.0	14.0	18.0	41.0	22.0

Table A.9: IS Dept Size by Building A Responsive IT Infrastructure.

IS Dept Size	Least Important (%)	Not Important (%)	Neutral (%)	Important (%)	Most Important (%)
Less than 10	4.0	7.0	7.0	26.0	56.0
Between 10-50	0.0	7.0	0.0	44.0	49.0
Greater than 50	0.0	5.0	5.0	40.0	50.0

Table A.10: IS Dept Size by Integrating Data Processing, Office And Factory Automation, And Telecommunication.

IS Dept Size	Least Important (%)	Not Important (%)	Neutral (%)	Important (%)	Most Important (%)
Less than 10	0.0	18.0	15.0	26.0	41.0
Between 10-50	0.0	26.0	15.0	37.0	22.0
Greater than 50	5.0	22.0	32.0	36.0	5.0

Table A.11: IS Dept Size by Integration Of Networks.

IS Dept Size	Least Important (%)	Not Important (%)	Neutral (%)	Important (%)	Most Important (%)
Less than 10	7.0	11.0	7.0	45.0	30.0
Between 10-50	0.0	4.0	7.0	33.0	56.0
Greater than 50	0.0	14.0	9.0	32.0	45.0

Table A.12: IS Dept Size by Improving IS Strategic Planning.

IS Dept Size	Least Important (%)	Not Important (%)	Neutral (%)	Important (%)	Most Important (%)
Less than 10	0.0	0.0	7.0	37.0	56.0
Between 10-50	0.0	0.0	0.0	22.0	78.0
Greater than 50	0.0	0.0	0.0	27.0	73.0

Table A.13: IS Dept Size by Improving Security And Control.

IS Dept Size	Least Important (%)	Not Important (%)	Neutral (%)	Important (%)	Most Important (%)
Less than 10	0.0	7.0	8.0	52.0	33.0
Between 10-50	0.0	7.0	15.0	52.0	26.0
Greater than 50	4.0	18.0	4.0	51.0	23.0

Table A.14: IS Dept Size by Improving Quality Of Software Development.

IS Dept Size	Least Important (%)	Not Important (%)	Neutral (%)	Important (%)	Most Important (%)
Less than 10	19.0	18.0	11.0	33.0	19.0
Between 10-50	7.0	11.0	4.0	52.0	26.0
Greater than 50	0.0	4.0	27.0	51.0	18.0

Table A.15: IS Dept Size by Train And Educate IS Professionals/End-User .

IS Dept Size	Least Important (%)	Not Important (%)	Neutral (%)	Important (%)	Most Important (%)
Less than 10	15.0	10.0	19.0	30.0	26.0
Between 10-50	0.0	7.0	7.0	60.0	26.0
Greater than 50	0.0	13.0	10.0	63.0	14.0

Appendix B: IS Staff Level by Issues

IS_Level in Organisation by key IS Issues.

Table B.1: IS_Level In Organisation by BPR.

IS_Level	Least Important (%)	Not Important (%)	Neutral (%)	Important (%)	Most Important (%)
Head of IS	2	12	17	46	23
One level below IS Head	0.0	8	17	33	42
Two or more level below IS	0.0	0.0	33	0.0	67
Others	0.0	0.0	100	0.0	0.0

Table B.2: IS_Level In Organisation by Competitive Advantage.

IS_Level	Least Important (%)	Not Important (%)	Neutral (%)	Important (%)	Most Important (%)
Head of IS	0.0	2	8	40	50
One level below IS Head	0.0	0.0	0.0	58	42
Two or more level below IS	0.0	0.0	0.0	67	33
Others	0.0	0.0	0.0	0.0	100

Table B.3: IS_Level In Organisation by Improving Data Integrity And Quality Assurance.

IS_Level	Least Important (%)	Not Important (%)	Neutral (%)	Important (%)	Most Important (%)
Head of IS	2	8	13	45	32
One level below IS Head	0.0	0.0	8	50	42
Two or more level below IS	0.0	0.0	0.0	33	67
Others	0.0	0.0	0.0	100	0.0

Table B.4: IS_Level In Organisation by Plan/Implement/Mange Systems Development.

IS_Level	Least Important (%)	Not Important (%)	Neutral (%)	Important (%)	Most Important (%)
Head of IS	0.0	10	10	38	42
One level below IS Head	0.0	17	17	16	50
Two or more level below IS Head	0.0	0.0	0.0	100	0.0
Others	0.0	0.0	0.0	100	0.0

Table B.5: IS_Level In Organisation by Planning For Disaster Recovery.

IS_Level	Least Important (%)	Not Important (%)	Neutral (%)	Important (%)	Most Important (%)
Head of IS	2	8	18	44	30
One level below IS Head	0.0	16	17	50	17
Two or more level below IS Head	0.0	0.0	0.0	33	67
Others	0.0	0.0	100	0.0	0.0

Table B.6: IS_Level In Organisation by Facilitating/ Managing ESS And DSS.

IS_Level	Least Important (%)	Not Important (%)	Neutral (%)	Important (%)	Most Important (%)
Head of IS	0.0	10	20	51	19
One level below IS Head	0.0	25	25	25	25
Two or more level below IS Head	0.0	0.0	67	0.0	33
Others	0.0	100	0.0	0.0	0.0

Table B.7: IS_Level In Organisation by Supporting End-User Computing.

IS_Level	Least Important (%)	Not Important (%)	Neutral (%)	Important (%)	Most Important (%)
Head of IS	0.0	19	8	48	25
One level below IS Head	8	0.0	8	58	26
Two or more level below IS Head	0.0	0.0	0.0	100	0.0
Others	0.0	100	0.0	0.0	0.0

Table B.8: IS_Level In Organisation by Specifying, Recruiting And Developing Human Resources For IS.

IS_Level	Least Important (%)	Not Important (%)	Neutral (%)	Important (%)	Most Important (%)
Head of IS	3	18	12	45	22
One level below IS Head	17	8	8	42	25
Two or more level below IS Head	0.0	67	0.0	33	0.0
Others	100	0.0	0.0	0.0	0.0

Table B.9: IS_Level In Organisation by Building A Responsive IT Infrastructure.

IS_Level	Least Important (%)	Not Important (%)	Neutral (%)	Important (%)	Most Important (%)
Head of IS	0.0	7	5	37	51
One level below IS Head	8	0.0	0.0	34	58
Two or more level below IS	0.0	33	0.0	33	34
Others	0.0	0.0	0.0	100	0.0

Table B.10: IS_Level In Organisation by Integrating Data Processing, Office And Factory Automation, And Telecommunication.

IS_Level	Least Important (%)	Not Important (%)	Neutral (%)	Important (%)	Most Important (%)
Head of IS	0.0	23	18	33	25
One level below IS Head	8	17	33	25	17
Two or more level below IS Head	0.0	33	0.0	33	34
Others	0.0	0.0	0.0	100	0.0

Table B.11: IS_Level In Organisation by Integration Of Networks.

IS_Level	Least Important (%)	Not Important (%)	Neutral (%)	Important (%)	Most Important (%)
Head of IS	2	10	5	38	45
One level below IS Head	8	0.0	25	25	42
Two or more level below IS	0.0	0.0	0.0	67	33
Others	0.0	100	0.0	0.0	0.0

Table B.12: IS_Level In Organisation by Improving IS Strategic Planning.

IS_Level	Least Important (%)	Not Important (%)	Neutral (%)	Important (%)	Most Important (%)
Head of IS	0.0	0.0	3	28	69
One level below IS Head	0.0	0.0	0.0	24	76
Two or more level below IS	0.0	0.0	0.0	67	33
Others	0.0	0.0	0.0	0.0	100

Table B.13: IS_Level in Organisation by Improving security and control..

IS_Level	Least Important (%)	Not Important (%)	Neutral (%)	Important (%)	Most Important (%)
Head of IS	0.0	14	8	53	25
One level below IS Head	8	0.0	17	50	25
Two or more level below IS Head	0.0	0.0	0.0	33	67
Others	0.0	0.0	0.0	0.0	100

Table B.14: IS_Level in Organisation by Improving quality of software development.

IS_Level	Least Important (%)	Not Important (%)	Neutral (%)	Important (%)	Most Important (%)
Head of IS	6	12	15	48	19
One level below IS Head	17	8	8	33	34
Two or more level below IS Head	34	33	0.0	0.0	33
Others	0.0	0.0	0.0	100	0.0

Table B.15: IS_Level in Organisation by Train and educate IS professionals/End-user.

IS_Level	Least Important (%)	Not Important (%)	Neutral (%)	Important (%)	Most Important (%)
Head of IS	5	10	15	45	25
One level below IS Head	8	8	0.0	67	17
Two or more level below IS Head	0.0	0.0	0.0	100	0.0
Others	0.0	100	0.0	0.0	0.0

Appendix C: Key IS Issues

Table C.1: Key IS Issues by Frequency (Full 9 point Likert scale)

	Frequencies								
Key IS Management issues.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Improving IS strategic planning.	0	0	0	0	2	8	14	24	28
Using IS for competitive advantage.	0	0	0	1	5	9	24	28	9
Plan/Implement/Manage systems development.	0	0	3	5	8	14	15	24	7
Facilitating/managing ESS and DSS.	0	0	4	6	17	13	21	11	4
Understanding Business process redesign	0	1	2	6	14	13	19	14	7
Planning for disaster recovery.	0	1	4	3	14	15	17	8	14
Building a responsive IT infrastructure.	0	1	0	5	3	13	15	26	13
Supporting end-user computing.	1	0	2	7	6	15	24	14	4
Improving security and control.	0	1	3	5	7	17	22	14	7
Integrating data processing, office and factory automation, and telecommunication.	1	0	12	5	15	9	16	13	5
Specifying, recruiting and developing human resources for IS.	0	5	11	3	8	16	17	13	3
Improve quality of Software Development.	2	5	4	5	10	21	13	9	7
Train and educate IS professionals/ end users.	0	4	5	3	9	18	20	12	5
Integration of networks.	0	2	3	4	6	12	16	22	11
Improving data integrity and quality assurance.	0	1	2	3	9	14	20	20	7

Appendix D: Re-categorisation Table

Re-categorisation Table.

This appendix display the organisations included in the "Other" variable of table industry groups. This table also shows which industry group the "Other" category was allocated.

Table D.1: Re-categorisation Table

No	Variable (Others)	No of Mentions	Allocated to
1	Information technology and Services.	1	Service including transport
2	Media.	1	Service including transport
3	Constructions.	4	Mining or petroleum
4	Private hospitals.	1	Service including transport
5	Engineering.	1	Mining or petroleum
6	Law firm.	2	Service including transport
7	Facility management.	1	Service including transport
8	Aluminium manufacturing.	1	Manufacturing industry
9	Environment consulting.	1	Service including transport
10	Health.	1	Service including transport
11	Telecommunications.	1	Service including transport

Appendix E: ANOVA Table

Table E.1: Post-Hoc One Way ANOVA Table

	One way ANOVA (p<.05)		
Key IS Management issues.	**Industry Group**	**Dept Size**	**IS Level**
IS strategic planning	.4833	.1708	.6230
IS for competition	.6073	.4337	.8621
IT infrastructure	.6361	.7064	.7084
Networking	.5463	.2545	.6544
Systems development	.5128	.2091	.7272
Quality assurance	.5661	.1818	.3573
Security and control	.3429	.4645	.8347
Disaster recovery	.8212	.5854	.3213
BPR	.5771	.4501	.3364
End-user computing	.6305	.4003	.9197
ESS and DSS	.2742	.0194	.3745
Education of IS staff	.6193	.3893	.7877
Integrated systems	.8816	.0641	.2260
Software Development	.0358	.2683	.6952
Human resources for IS	.6640	.7945	.9150

Appendix F: Survey Instrument

Key Issues in Management of IS Survey 1997

Please return your completed survey in the return envelope provided by ;

Reviewers of this survey are Syed ARSHAD (Masters candidate) and Andrew STEIN (Lecturer) of the Department of Information Systems, Victoria University of Technology.

SURVEY QUESTIONS

SECTION 1. ORGANISATION

1. Circle the number that indicates your organisation's Major industry group.

1. Mining or Petroleum
2. Insurance or Financial Services
3. Banking or Lending
4. Services including Transport
5. Retail or Distribution
6. Manufacturing Industry
7. Public Sector
8. Education and Training
9. Other.....

2. What is the size of the workforce of your organisation?

1. Less then 100 2. Between 100 and 500 3. Greater than 500

3. How many Information systems staff are in your organisation?

1. Less then 10 2. Between 10 and 50 3. Greater than 50

4. What organisational level describes your position?

1.One level below CEO
2. Two below CEO
3.Three level below CEO.
4. four or more level below CEO.

5. What IS Level bets describes your position?

1. Head of IS section
2. One level below IS head.
3. Two or more levels below IS head.
4. Other.....

Section 2. Key IS Issues.

Least Important		Moderately Important					Most Important	
1	2	3	4	5	6	7	8	9

(Please fill in your rating in the spaces provided)

____ **Improving IS strategic planning.**

It has been important to align long-range IS plans with strategic business plans. Rapidly changing business environments, increased involvement of end users, and accelerate technological change underscore the need to continue improving strategic planning skills.

____ **Using information system for competitive advantage.**

In many business, long-term survival is dependent on using information systems to gain competitive advantage. Competitive advantage results from recognition of opportunities through creativity and innovation, followed by rapid implementation. These are historical weaknesses of the IS organisation.

____ **Manage/plan systems development/ Implementation.**

Better managing and planing is required in systems development. Rapid analysis and implementation is necessary in an environment where technological and business changes are continual.

____ **Facilitating/ managing executive and decision support system.**

Improving the effectiveness of managers and executives an important objective for information systems. There has been much promised but too little success in the these areas.

____ **Business process redesign.**

To remain competitive, many organisations are radically changing the way they do business. It plays an increasingly important role in this change process by enabling the innovative redesign of core business processes. Much has been learned about IT implementation in general which can help facilitate and manage BPR projects.

____ **Planning for disaster recovery.**

An important element in any organisation using information systems is the disaster recovery plan. A disaster may result from many caused. These can be natural and those caused by people. Therefore a disaster recovery plan is very important element of security system.

____ **Support end-user computing.**

The proliferation of end-user computing through personal computers offers the promise of improved productivity but also the danger of inadequate management control. Information systems management must balance control against the need for slack. Clarification of IS and end-user role is a necessity.

____ **Building a responsive IT infrastructure.**

Building a technology infrastructure that will support existing applications while remaining to change is a key to long-term enterprise productivity. This task is frustrated by the continuing rapid changes in infrastructure technology and the increasing breadth and depth of applications which need to be supported.

____ **Improving security and control.**

As organisations increase their dependence on information systems, there is a greater risk from destruction and alteration of data, disclosure to outside sources and disruption of information services. Tight secure controls and fault tolerance information delivery are becoming a necessity.

Least Important		Moderately Important						Most Important
1	2	3	4	5	6	7	8	9

(Please fill in your rating in the spaces provided)

____ **Integrating data processing, office automation, factory automation, and telecommunication.**

The capability now exists to integrate systems that are based on these diverse technologies. As organisations try to integrate these technologies, organisational and managerial problems will need to be solved.

____ **Specifying, recruiting, and developing human resources for IS.**

Current and future shortages of qualified IS personnel threaten the organisation's ability to make effective use of information technology. More emphasis needs to be put on developing business skills such as teamwork and leadership and staying current with new technology such as object-oriented and multimedia applications.

____ **Improving quality of software development.**

The application development backlog remains at unacceptably high levels. Traditional development, methods and platforms are no longer satisfactory. New methods and platforms have not yet proven themselves. Sophisticated users are getting impatient. Improved quality and effectiveness will be essential for next-generation applications.

____ **Train and educate IS professionals/end users.**

Organisations should spend more effort in training their managers and users in new Information systems technologies. Outsourcing and downsizing have changed the landscape for IS professionals. The IS professional needs to have marketing skills as well as transferable IT skills.

____ **Integration of networks.**

Organisations are moving towards networking environment for various reasons. Better planning is required in developing these networks. External and large scale Intranet networks are creating the need for business advantage to be gained from the application and integration of networks.

____ **Improving data integrity and quality assurance.**

Mainframe applications, timesharing extracts, and personal computer applications are all used to analyse data and prepare reports. Frequently there are discrepancies among these different data sources due to lack of controls in IS and user departments. Too often computer printouts are assumed to be accurate. Such assumptions can lead to faulty decisions.

____ **Your Key IS Issue 1.....**

____ **Your Key IS Issue 2.....**

____ **Your Key IS Issue 3.....**

____ **Your Key IS Issue 4.....**