INFORMATION SYSTEMS MANAGEMENT: AN AUSTRALASIAN VIEW OF KEY ISSUES - 1996

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ABSTRACT

As part of a longitudinal study of key information systems management issues, a survey of Australasia's largest 500 organisations was conducted to identify which issues were perceived by the IS executives as being important, problematic and critical over the next three to five years. The most critical issues were revealed to be a mix of technology management issues (IT infrastructure, communications, disaster recovery), strategic management issues (competitive advantage, IS planning, aligning the IS organisation), people management issues (organisational learning, educating senior management in IT), systems development and data management issues (effective use of the data resource), and end-user computing. This reflects the need for a balance of business, technical, and people skills in an IS executive. Non-critical issues were mostly related to systems development and the individual technologies which must be integrated and managed to ensure a responsive IT infrastructure. The study also reveals that some issues are much more important than problematic (disaster recovery, competitive advantage, information architecture, and IS alignment) while others are much more problematic than important (end-user computing, IS role and contribution, and BPR). The former reflects a growing level of knowledge in handling these issues, while the latter reflects a continuing problem with them. The differences between this study and similar studies conducted in 1988 and 1992 show that there is a growing confidence in the IS executive's ability to manage the strategic issues, a continuing concern about providing a responsive IT infrastructure (especially communications), and a continuing concern with educating all 'customers' in the organisation in the effective use of IT, including senior management.

INTRODUCTION

Rapidly changing business environments are challenging information systems (IS) executives as evidenced by the now familiar themes of downsizing, outsourcing, leveraged buyouts, strategic alliances, flexible manufacturing, just-in-time scheduling, globalisation, business process reengineering and total quality management. These environmental changes place demands on IS departments to support product innovation, new production techniques, and changing organisational designs, and provide timely, high-quality information. As a result, the role of IS executives has shifted from merely supporting a technical operation to a strategic role providing information for the organisation to implement strategies and achieve objectives (Galliers et al. 1994).

Identifying and handling key issues in the management of information systems is essential for IS executives to support their organisations efficiently and effectively. The investigation of these key issues by researchers serves to enhance understanding of the concerns of IS executives and suggest relevant areas of investigation by IS management researchers. The aims of this study are to:

- determine the IS management issues most important, problematic and critical to Australasian IS executives over the next 3-5 years;
- examine trends in the status of different issues over time;
- inform IS professionals of current and future issues;
- inform IS researchers of relevant issues to investigate.

A BRIEF HISTORY OF KEY ISSUES STUDIES

Many key issues studies have now been carried out, from Ball and Harris (1982) to the most recent (1995) SIM (USA) survey (Brancheau et al., 1996). An historical summary of 21 major studies has been provided in Table 1 below:

Authors	Year of Study	Country	Sample (Response rate)	Total No. of Issues	Research Method
Ball & Harris	1982	U.S.A	SIM Members (417 / 1400)	18	Survey
Martin	1982	U.S.A	IS Executives (15/??)	8	C.S.F Interviews - 2 Rounds
Dickson, Leitheiser, Wetherbe & Nechis	1984	U.S.A	SIM members (54 / ??)	19	Four round Delphi Survey
Hartog & Herbert	1986	U.S.A	IS Managers (63 / 107)	21	Survey and Interviews
Brancheau & Wetherbe	1987	U.S.A	IS & Gen. Mgrs. (68/180)	26	Three round Delphi Survey

Parker & Idundun	1987	United Kingdom	IS Managers (45 / 100)	23	Survey and Interviews
Rao, Huff & Davis	1987	Singapore	IS Managers (19 / 105)	??	Survey
Davenport & Buday	1988	Europe	IS Executives (75/2000)	??	Survey
Watson	1988	Australia	IS Managers (48 / 200)	26	Three round Delphi Survey
Moynihan	1990	Ireland	CEO/IT Mgrs. (49/??)	??	Structured Interviews
Caudle, Gorr & Newcomer	1991	U.S.A	PS Mgrs. (354 / 1054)	37	Survey
Niederman, Brancheau & Wetherbe	1991	U.S.A	SIM Members (1. (104 / 241)	25	Three round Delphi Survey
Watson & Brancheau	1991	International comparison	Previous studies compared	15	Descriptive/ interpretive
Badri	1992	Gulf Coop'n Council	IS CEOs (96 / 120)	20	Survey
Clark	1992	U.S.A	IS Executives (30)	6	Structured Interviews
Doukidis, Smithson & Naoum	1992	Greece	IS Managers (40)	20	Personal Interviews
Galliers, Merali & Spearing	1992	United Kingdom	Managers (incl. IS) (98/??)	26	Survey
Pervan	1992	Australia	IS Managers (1. (88 / 300)	34	Three round Delphi Survey
Wang & Turban	1994	Taiwan	IS & Gen. Mgrs. (297 / 928)	30	Survey
Davis, Menon, Munday, Thomson & Young	1995	New Zealand	Various (118/392)	23	Three round Delphi Survey
Kim & Sato	1995	Japan	IS professionals (197/400)	25	Survey
Brancheau, Janz & Wetherbe	1995	U.S.A.	SIM Members (83/217)	23	Three round Delphi Survey

Table 1: A History of Key Issues Studies

The most common research approach used has been the postal survey, either single-round or in three- or four-round Delphi studies. The major US studies have sampled the membership of the Society for Information Management (SIM) whose membership consists of a mix of IS academics and practitioners. Most other studies have obtained opinions from IS managers and/or other non-IS managers. In most cases the organisations sampled have been quite varied in size and industry, and the sample sizes have varied significantly. The studies have generally sought opinions of the major 'key' or 'critical' information systems management issues facing these organisations. One of the most recent studies (Galliers et al., 1994) considers issues as *important* (they have a significant impact within the organisation), *problematic* (they are difficult to manage), and *critical* (they are both important and problematic).

THE KEY ISSUES

As indicated in Table 1, there are many different IS management issues. While most researchers accept that IS executives must handle many *technology management (TM)* issues, there is a growing acceptance that there are many *strategic management (SM)* issues which are equally, if not more, important. Other categories of issues include *systems development and data management (SDDM)*, *people management (PM)*, and *end-user computing (EUC)*. A brief discussion of the major categories and issues follows, though it should be pointed out that some of the issues may overlap some categories. These issues have changed over time, but those discussed below are based on the most recent Australian (Pervan, 1994), US (Brancheau et al., 1996), and UK (Galliers et al., 1994) studies.

Technology Management Issues

In the 1990s organisations are heavily committed to investment in information and communications technology. The major technology management issues may include:

- building a responsive IT infrastructure (to support applications in the face of rapidly changing technologies and range of applications);
- measuring IS effectiveness and productivity (to justify investment in new technologies);
- improving data integrity and quality assurance (to overcome inconsistencies between different data sources and the lack of controls in IS and user departments);
- developing and managing electronic data interchange (to provide electronic communication with customers and suppliers);
- planning and integrating multi-vendor open systems technologies (in the face of a variety of operating environments and unstable standards);
- integrating data processing, office automation, and telecommunications;
- managing data and document storage;
- planning and managing communications networks (the 'lifeblood' of the 1990s organisation);
- implementing and managing collaborative support systems (to help teams share information and improve their effectiveness); and
- establishing effective disaster recovery capabilities (to guard against downside risks and potential loss of business).

Strategic Management Issues

Traditionally, the IS function was seen by top management as being primarily a support activity with little impact on the profitability or nature of the business (Doukidis et al., 1991), but this viewpoint is changing in the 1990s. IS strategic planning can help to identify high return applications, gain competitive advantage, improve the IS function, support business strategy, and provide a general framework to guide the activities of the organisation. The major strategic management issues thus may include:

- improving IS strategic planning (to align IS plans with business strategic plans in the face of changing business and technological environments, increasing user involvement);
- developing and implementing an information architecture (to identify major business categories and relationships to business processes, guide applications development, and facilitate better data integration and sharing);
- aligning the IS organisation within the enterprise (which may require a combination of centralised and decentralised structures);
- outsourcing selected information services;
- determining appropriate IS funding levels;
- facilitating and managing business process redesign (where IT may play an increasingly important role); and
- using information systems for competitive advantage (by recognising opportunities through creativity and innovation followed by rapid implementation).

People Management Issues

Current and future shortages of qualified information systems personnel threaten the IS department's ability to keep up with the information requirements of the organisation and greater business skills are needed to provide a better understanding of these needs. Further, the members of the organisation as a whole (including senior management) need to develop appropriate knowledge and understanding in the use of information systems and technology. The major people management issues thus may include:

- recruiting and developing IS human resources (to overcome shortages, develop career paths, enhance business skills and skills with new technologies and methodologies);
- facilitating organisational learning (in order to make appropriate use of information technologies across the entire organisation);
- educating senior management in relation to IT (to support resource allocation to IT and enhance understanding of the strategic impact of IT); and
- increasing understanding of IS role and contribution (by all members of the organisation).

Systems Development and Data Management Issues

In the 1980s the IS discipline was mostly concerned with the problems of systems development and data management (Hartog and Herbert 1986). A growing number of techniques and tools have been developed to improve the productivity and quality of IS development. The major systems and data issues may include:

- improving the effectiveness of software development (to reduce backlogs through new development methods and platforms);
- selecting and integrating packaged applications software (which may cut costs and boost productivity, but may result in integration and maintenance problems);
- making effective use of the data resource (through appropriate database technologies and valuing data as a corporate asset);
- managing the existing portfolio of legacy applications (which may affect integration of new technologies and migrating to new operating environments);
- developing and managing distributed systems (where client-server environments provide problems of consistency of software versions and data, and challenges in project management);
- improving information security and control;
- planning and managing the applications portfolio (and the ever-increasing maintenance problem); and
- planning and using CASE technology (to more effectively support the systems development process).

End-user Computing Issues

One of the most significant IS challenges is the control of computing by end users who may develop and/or operate systems independently of the IS department (Doukidis et al. 1991). The IS department must balance control with learning and innovation in order to provide support for these end users. These issues may include:

- facilitating and managing end-user computing (by balancing control against the need for slack and clarifying the respective roles of IS and end-users); and
- facilitating/managing executive and decision support systems (to improve decision making by executives and other members of the organisation).

RESEARCH DESIGN

In order to provide information concerning the key IS management issues, a postal survey of the most senior IS person in the top 500 Australasian organisations was conducted in March/April, 1996. The Bulletin magazine's publication of the 'Top 500' organisations in Australia and New Zealand in 1995 (Jacques, 1995) provided a list (and associated financial and classification data) of the 500 largest organisations by revenue. From the list of identified organisations, a mailing list of the most senior IS person in each organisation was developed by telephone contact to each organisation to identify the name and exact title of the appropriate person. (Personal identification and addressing of postal surveys is a recommended strategy for increasing response rates (Forsgren 1989)). In the course of the development of this mailing list, some organisations were removed because they were either subsidiary to other (larger) organisations on the list which provided the IT management function or because they were just unwilling to participate in such surveys. A final list of 490 'CIOs' (Chief Information Officers) was produced (though some of these CIOs used other titles, including IT Manager, IS Manager, and Director of IT).

The aim of this study was to identify the key IS management issues for these organisations over the next 3-5 years. The approach taken was similar to the most recent UK study (Galliers et al., 1994) where the respondents were asked to rate both how *important* and how *problematic* each issue was for their organisation. A list of 31 issues with an associated paragraph of explanation for each issue was produced from the 25 most critical issues from the last Australian study and any new issues from the most recent US and UK studies. In addition to the brief title for each issue, a paragraph explaining the issue (its 'rationale') was included to ensure that the meaning of each issue was interpreted consistently across all respondents. These 31 issues have been briefly discussed in the previous section and a list of all issues and their rationale is provided as Appendix A.

THE RESULTS OF THE STUDY

Valid questionnaires were received from 105 of the 490 organisations, representing the full range of the organisations targeted (including the 1st and 497th ranked organisations). Table 2 below shows that these are

indeed large organisations with revenue, assets and profits measured in the billions of dollars. Table 3 shows the location of company headquarters and the sector to which that organisation's primary activity belongs. The response rate of 21.4% may be considered reasonable in a postal survey of this nature.

Variable	Mean ($b)	St. Dev. ($b)	Min. ($b)	Max. ($b)
Revenue	1.339	4.376	0.160	18.487
Assets	1.868	2.986	0.014	30.287
Profit	0.083	0.248	-0.372	1.753

Table 2: Respondent Organisations - Financial Data

Headquarters Sector	Vic	NSW	SA	Qld	WA	ACT	NT	NZ	Total
Resources/Mining	3	3	0	0	1	0	0	0	7
Retail/Trading	4	6	0	2	1	0	0	0	13
Services	8	7	2	2	2	0	0	0	21
Manufacturing	14	25	2	1	4	0	0	1	47
Government	5	3	1	3	2	2	1	0	17
Total	34	44	5	8	10	2	1	1	105

Table 3: Respondent Organisations - HQ and Sector

As Table 3 above indicates, responses were received from all states and territories and one from New Zealand (a major beer producer). The largest sector represented in the sample (and in the target Top 500 population) was manufacturing (45%), while major government instrumentalities for energy, water, and transport made up most of the 16% from the government sector. The two most populous states, New South Wales and Victoria, made up 74% of the sample, confirming that the majority of company headquarters of large Australian organisations are in Sydney and Melbourne. Chi-squared goodness of fit tests on location of headquarters, rank in the top 500, and industry sector showed the sample to be representative at the 5% level of significance.

Critical Issues

As indicated earlier, respondents were asked to rate both how *important* an issue will be for their organisation over the next 3-5 years, and how *problematic* the issue might be. These were both rated on a 1 to 10 scale where 1 represented a lowest priority issue and 10 represented a highest priority issue. All respondents provided a score for both on all issues. Before separately examining the important issues, and similarly the problematic issues, the two ratings were combined into an overall rating of the issue. In previous studies, issues were usually assessed on how *critical* they were for the organisation. This study used the approach of Galliers et al. (1994), where a *critical* issue was defined as being both *important* and *problematic*. Based on this definition, how *critical* an issue was to the organisation was calculated as the arithmetic mean of the ratings for important and problematic. The ten most critical issues, with their ranking, mean and standard deviation of critical rating, are shown in Table 4 below. A full list showing mean and standard deviation for all 31 issues is provided as Appendix B.

Rank	ISSUE	Issue Category	Mean Rating	Std. Dev.
1	Building a responsive IT infrastructure	TM	7.19	1.65
2	Planning and managing communications networks	TM	6.93	1.92
3	Establishing effective disaster recovery capabilities	TM	6.88	1.66
4	Making effective use of the data resource	SDDM	6.87	1.63
5	Facilitating organisational learning	PM	6.86	1.59
6	Facilitating and managing end user computing	EUC	6.80	1.73
7	Educating senior management in relation to IT	PM	6.73	1.96
8	Using information systems for competitive advantage	SM	6.72	1.91
8	Improving IS strategic planning	SM	6.72	1.91
10	Aligning the IS organisation within the enterprise	SM	6.71	2.04

Table 4: The Ten Most Critical Issues

The relative ranking of issues within the top 10 should not be overly highlighted because their mean ratings range only by 0.48 on a 10-point scale (with a range of only 0.22 between 2nd and 10th) and the average standard deviation is 1.80. However, it is interesting to note that each of the five issue categories have one or more issues in this top group. While previous research seemed to indicate that there would be a trend away from technology management for CIOs, this is contradicted by the appearance of *IT infrastructure, communications,* and *disaster recovery* (all technology management issues). However, this should come as no surprise in such a rapidly changing technological environment. It is clear that the fundamental role of the CIO is the provision of a responsive IT infrastructure for the organisation and that communications networks provide the backbone of that infrastructure in the 1990s. This infrastructure can also be assumed to play a critical role in recognising, accessing, and utilising the organisation's data resources (ranked 4th).

People management issues also rank highly, with the issues of *organisational learning* and *educating senior management in IT* ranked 5th and 7th, respectively, and *end-user computing* (which involves similar motivations and contains a significant user training/education component)) ranked 6th. With the advent of desktop computers and distributed computing, larger organisations are beginning to view the non-IS people in the organisation as 'customers' rather than 'users' and to perceive IS as a service function for those customers (Pitt et al., 1995). Further, the IT education of the customers comes through very strongly in these issues, both from an organisational efficiency and effectiveness viewpoint (through increased productivity and reducing applications backlogs - see Brancheau and Brown (1993)), and as a strategy for enhancing the acceptance of IS within the organisation (Moynihan, 1990). An emphasis on supporting and managing organisational learning can lead to significant increases in innovation and productivity from an organisation's IT investment (Henderson and Lentz, 1996).

As indicated in Table 4, some strategic issues also ranked highly (in addition to the fact that some of the technology and people management issues have strategic aspects). *Strategic IS planning* (SISP) continues to be a major issue, being ranked 9th. It is a key element of IS management and the CIO must lead in the use of formal methods for SISP and encourage good practice within the organisation (Earl, 1993). This can facilitate effective management of other strategic issues such as the *alignment of IS within the enterprise* (ranked 10th) and identifying opportunities to use *IS for competitive advantage* (ranked 8th).

In summary, the most critical issues were revealed to be a mix of technology management issues (IT infrastructure, communications, disaster recovery), strategic management issues (competitive advantage, IS planning, aligning the IS organisation), people management issues (organisational learning, educating senior management in IT), systems development and data management issues (effective use of the data resource), and end-user computing. This reflects the need for a balance of business, technical, and people skills in an IS executive.

Non-Critical Issues

The issues which were rated and ranked the ten least critical are shown in Table 5 below. Overall, it may be observed from Table 5 that individual technology management and systems development and data management issues are of little concern to the CIO. Five of the ten least critical issues relate to individual information technologies (namely, *electronic data interchange, collaborative systems, data/document storage, multi-vendor integration,* and *CASE*) and three relate to specific systems management issues (namely, *distributed systems, applications portfolio,* and *legacy systems*). While these systems and technologies are part of the overall infrastructure, it is their overall selection, integration, and management which is of greater concern to the CIO and the organisation.

Rank	ISSUE	Issue Category	Mean Rating	Std. Dev.
22	Developing and managing distributed systems	SDDM	6.16	2.35
23	Determining appropriate IS funding levels	SM	5.98	2.09
24	Developing and managing electronic data interchange	TM	5.84	2.01
25	Implementing and managing collaborative systems	TM	5.73	2.17
26	Managing data and document storage	TM	5.64	1.91
27	Planning and managing the applications portfolio	SDDM	5.60	1.85
28	Managing existing portfolio of legacy applications	SDDM	5.49	2.07
29	Multi-vendor open systems technologies	TM	5.41	2.27
30	Outsourcing selected information services	SM	5.24	2.41
31	Planning and using CASE technology	TM	4.39	2.21

Table 5: The Ten Least Critical Issues

Of the strategic management issues, *determining IS funding levels* ranks quite low. This may reflect a growing recognition by the senior management of organisations of the value of IT to the organisation and, as a result, less pressure on the CIO in arguing the case for appropriate funding of IT. The major surprise in this list of non-critical issues *is IT outsourcing* which ranked almost last. It may be that these CIOs believe that, despite the hype, they have (or soon will have) solved their IT outsourcing decision problems. It may also be that this issue is perceived by CIOs as more of a specific IT infrastructure issue and whether a technology or service is provided in-house or outsourced is of little concern as long as it is provided. However, further analysis revealed that the rating of this issue was significantly higher for the 17 government organisations than for the organisations in the other sectors. Political leaders continue to see outsourcing of services (including IT) as a major strategy for smaller government and the CIOs of these organisations recognise that this is unlikely to change in the foreseeable future.

Important vs. Problematic Issues

In order to clarify the distinction between what is important and what is problematic, the issues which rated, on average, in either the ten most important issues or the ten most problematic issues are summarised in Table 6 below. This also helps to clarify why some issues are more critical than others (because they are important and problematic).

Prob. Rate	Prob. Rank	ISSUE	Imp. Rank	Imp. Rate
6.82	1	Building a responsive IT infrastructure	2	7.55
6.40	5	Planning and managing communications networks	3	7.46
6.13	11	Establishing effective disaster recovery capabilities	1	7.62
6.40	5	Making effective use of the data resource	7	7.33
6.43	4	Facilitating organisational learning	8	7.30
6.52	2	Facilitating and managing end user computing	12	7.09
6.33	8	Educating senior management in relation to IT	11	7.13
6.00	18	Using information systems for competitive advantage	4	7.45
6.18	10	Improving IS strategic planning	9	7.26
6.01	17	Aligning the IS organisation within the enterprise	5	7.41
6.00	18	Developing & implementing an information architecture	6	7.38
6.04	14	Improving information security and control	10	7.25
6.51	3	Increasing understanding of IS role and contribution	18	6.70
6.26	9	Facilitating and managing business process redesign	20	6.55

Table 6: Important vs. Problematic issues

Table 6 indicates that substantial differences exist between the rankings of problematic and important issues. A rank correlation test of the first 20 important issues with the first 20 problematic issues shows a correlation of only 0.096. Interestingly, the rankings of the remaining issues (the eleven least important and problematic issues) were almost identical, which implies that the non-critical issues are so because they are perceived to be neither important nor problematic.

Issues which are ranked as far more important than problematic include *disaster recovery, competitive advantage, information architecture* and *IS alignment*. This may be because these issues are perceived as important to the organisation (i.e., they can have a significant impact on the organisation), but the CIOs believe that in the future they will have them under control. The growing acceptance and quality of strategic IS planning supports the belief that developing an appropriate information architecture (a direct outcome of SISP), identifying IS for competitive advantage, and properly aligning the IS organisation will be facilitated more easily (Earl, 1993).

On the other hand, issues which are ranked far more problematic than important include *end-user computing, IS role and contribution*, and *business process redesign (BPR)*. Clearly, these issues are not well managed now and the CIOs of these large organisations believe that they may continue to be difficult issues to manage. The literature on end-user computing (Brancheau and Brown, 1993) and BPR (Earl, 1994; Wastell et al., 1994) both support this concern. The issue concerning the development of an understanding of IS role and contribution is closely associated with the other 'education' issues - facilitating organisational learning and educating senior management in IT (both of which also ranked more problematic than important as shown in Table 6) - and indicates a growing concern for developing knowledge and understanding of IT throughout the organisation.

Comparison with Previous Australian Studies

As indicated earlier in this paper, there have been many previous key issues studies but this comparison will focus on the previous Australian key issues studies conducted in 1988 Watson, 1989) and 1992 (Pervan, 1994). Table 7 below summarises the comparative rankings of the key issues from these studies and whether its status as an issue is *rising, steady,* or *falling*. For an issue to be included in the comparisons table it had to rank in the top ten issues in either 1988, 1992 or 1996, and the fifteen such issues fall neatly into three groups - the five 'rising stars' (which have risen significantly over the eight years), six issues which have remained fairly steady over that period, and four 'falling stars' (which have fallen significantly over the three studies).

The five 'rising stars' fall into a group of technology infrastucture management issues and a pair of educational issues. The biggest upward movers since 1988 have been *IT infrastructure, communications networks,* and *disaster recovery.* In the face of the rapid pace of technological change, the management of the IT infrastructure should be expected to be a key issue and the most fundamental underlying technology is the organisation's communications network which provides the critical linking of members of the organisation with each other and with the outside world. Intranets and the internet can be expected to be major concerns for the CIO for some time to come. In this rapidly changing technological environment it is becoming increasingly important for all levels of the organisation to receive an IT education which will maintain their effective utilisation of the IT resource. This is reflected in the rise of both *organisational learning* and *IT education of senior management* as key issues.

ISSUE	1988	1992	1996	Status
Building a responsive IT infrastructure	NI	2	1	Rising
Planning and managing communications networks	13	15	2	Rising
Establishing effective disaster recovery capabilities	NI	10	3	Rising
Making effective use of the data resource	9	4	4	Steady
Facilitating organisational learning	10	12	5	Rising
Facilitating and managing end user computing	8	11	6	Steady
Educating senior management in relation to IT	NI	NI	7	Rising
Using IS for competitive advantage	7	5	8	Steady
Improving IS strategic planning	1	1	8	Steady
Aligning the IS organisation within the enterprise	5	3	10	Steady
Developing & implementing an information architecture	3	6	11	Steady
Improving data integrity and quality assurance	11	7	17	Falling
Improving the effectiveness of software development	4	8	21	Falling
Increasing understanding of IS role and contribution	6	9	14	Falling
Recruiting and developing IS human resources	2	NR	20	Falling

Table 7: Historical Comparison of Australian Key Issues Studies
(NI = not included in the study; NR = not ranked in the top 20)

Examination of the 'steady' issues shows that they include the four major strategic management issues of *IS for competitive advantage, IS strategic planning, IS organisational alignment,* and *information architecture.* These have been fairly steady (though slipping slightly in rank) and may reflect a growing confidence that these issues are being done better through the use of more formal approaches and a perhaps a better understanding of the relationship between the CIO and CEO (Feeny et al., 1992). *Facilitating and managing end-user computing* has continued to be (and will probably always be) a fairly critical issue (Brancheau and Brown, 1993). Similarly, *making effective use of the data resource* will continue to be fairly critical in an environment where a greater variety of data (internal and external to the organisation) on a greater variety of platforms need to be accessed, manipulated, analysed, and presented by and for the user-customers.

Among the 'falling stars', *improving data quality* and *improving software development effectiveness* both may reflect a better attitude to quality and effectiveness in Australian organisations (or at least a perception that this is being achieved), and so a growing confidence among CIOs that these issues are now under control. Similarly, the the fall of *understanding IS role and contribution* may also reflect better communication between CIO and the organisation's senior management (Feeny et al., 1992). Finally, the issue of *recruiting and developing IS human resources* may be associated with a number of changes including greater availability of people with the necessary skills, reliance on the outsourcing of IS services (provided by large and small consulting

organisations), and technologies which give the end-users greater capacity to develop their own systems and solve many of their own problems.

CONCLUSIONS AND FURTHER RESEARCH

This paper has presented some results from a study of the key issues facing IS executives in Australasia's largest 500 organisations. The most critical issues are a mix of technology management issues (IT infrastructure, communications, disaster recovery), strategic management issues (competitive advantage, IS planning, aligning the IS organisation), people management issues (organisational learning, educating senior management in IT), systems development and data management issues (effective use of the data resource), and end-user computing. This reflects the need for a balance of business, technical, and people skills in a CIO. Non-critical issues are mostly related to systems development and the individual technologies which must be integrated and managed to ensure a responsive IT infrastructure.

The study reveals that some issues are much more important than problematic (disaster recovery, competitive advantage, information architecture, and IS alignment), which reflects a growing level of knowledge in handling these issues. Other issues, however, are much more problematic than important (end-user computing, IS role and contribution, and BPR), and this reflects a continuing problem with their effective management.

The differences between this 1996 study and the Australian studies conducted in 1992 (Pervan, 1994) and 1988 (Watson, 1989) show that there is a growing confidence in the CIOs ability to manage the strategic issues, a continuing concern about providing a responsive IT infrastructure (especially communications), and a continuing concern with educating all 'customers' in the organisation, including senior management. On the other hand, system and data quality issues, IS role and contribution, and IS human resources are becoming less critical.

This descriptive survey has its limitations, however, and further explanatory work, which will atempt to answer some of the reasons behing the issues, is planned. A follow-up survey will revisit the issues and collect information from the CIOs concerning various aspects of organisational structure, management style, stage of IT maturity, the external environment, and other factors with a view to identifying factors which may explain why different issues vary in how important, problematic, and critical they are in different organisations. Another follow-up study will be to provide the list of issues to the chief executive officers (CEOs) of these and compare their ratings with the CIOs. Finally, a series of case studies is planned which will involve interviews of a number of the CIOs in the Top 500 organisations to investigate the reasons behind the relative ratings of the different issues.

NOTE: An earlier (and smaller) version of this paper has been accepted for presentation at the 7th Australasian Conference on Information Systems, University of Tasmania, December 1996.

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Appendix A: Key Issues Questionnaire

What do you consider to be the most critical IS/IT issues facing your organisation over the next **three to five years**? You are requested to indicate the general level of importance that issue will have for your organisation and also (separately) how problematic it might be on a day to day level. Please indicate your views by rating each issue on the scale 1 to 10, where 1 indicates a **lowest** priority issue and **10** indicates a **highest** priority issue. The more important/problematic the issue the higher the score. Use the spaces below to assign your ratings. **Remember, for each issue give one importance score and one problematic score.** Each issue is supported by an associated rationale to clarify its meaning.

Lowest Priority Issue				Moderate Priority Issue				Highest Priority Issue	
1	2	3	4	5	6	7	8	9	10

(Please fill in your rating of how important AND how problematic the issue is in the spaces provided.)

Important   Problematic KEY ISSUES AND THEIR RATIONALE

1._____ _____ **Developing and implementing an information architecture.**
A corporate/global information architecture is needed to identify the major information categories used within an enterprise and their relationships to business processes. It is essential for guiding applications development and facilitating the integration and sharing of data.

2._____ _____ **Improving information 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 security controls and fault tolerant information delivery are becoming a necessity.

3._____ _____ **Facilitating organisational learning**
Organisations that prosper will need to make appropriate use of information technologies across their entire enterprise. Business practices and organisational structures will need to be modified in many cases. IS also must demonstrate its own ability to learn and use new technology.

4._____ _____ **Recruiting, and developing IS human resources**
Current and future shortages of qualified information systems personnel threaten the organisation's ability to make effective use of information technology. Career paths need to be clarified. 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 multi-media applications.

5._____ _____ **Measuring IS effectiveness and productivity**
Understanding how IT use impacts the bottom line is crucial for justifying new investment. In addition, measuring the IS organisation's performance is necessary for effective management. Measurement is becoming more important as companies attempt to reduce operating expenses to meet the competition.

6._____ _____ **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 output is assumed to be accurate. Such assumptions can lead to faulty business decisions.

7._____ _____ **Improving the effectiveness of software development**
The application development backlog remains at unacceptably high levels. Traditional development methods and platforms are no longer satisfactory while new methods and platforms have not yet proven themselves. Sophisticated users are getting impatient. Improved effectiveness will be essential for next-generation applications.

8._____ _____ **Facilitating/managing executive and decision support systems**
Increasing the ability to exploit situations for competitive advantage depends on enhancing the ability of management to "experiment" with decision possibilities. Many other issues also depend on this capability. Decision support tools have long been viewed as a method for introducing modelling tools to executives to improve their decision making, however those efforts have met with mixed success.

9._____ _____ **Selecting and integrating packaged application software**
The changing relationship among costs of hardware, packaged software, and human resources makes managing this aspect of the business critical. Using purchased application software can cut costs, boost productivity, and increase user satisfaction, but it can result in poor integration of systems and serious maintenance problems.

10._____ _____ **Aligning the IS organisation within the enterprise**

The IS organisation's effectiveness in supporting the enterprise's needs is dependent on its organisational location within the enterprise. Appropriate alignment may require a combination of centralised and decentralised structures. Too often IS is not located and structured appropriately.

11._____ _____ Improving IS strategic planning

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

12._____ _____ Making effective use of the data resource

The organisation's data resource is growing in size, complexity, and value. Despite this, it remains largely unrecognised, inaccessible, and underutilised. IS must develop a climate within its department and throughout the organisation which values the data resources as a corporate asset.

13._____ _____ Developing and managing electronic data interchange

Electronic communication with customers and suppliers may offer competitive advantage to a company or it may be a requirement for staying in business. IS executives must develop (or adapt to) standard transaction formats, keep current on technology developments, and learn to manage inter-organisational projects.

14._____ _____ Outsourcing selected information services

The internal information systems organisation no longer has a monopoly. Outside contractors may be able to provide some services more effectively. What services should be outsourced? How should contractor relationships be managed? Fair and objective evaluation techniques are needed which assess both costs and benefits as well as potential risks from loss of control.

15._____ _____ Planning and integrating multi-vendor open systems technologies

Many companies are moving away from single-vendor proprietary operating environments to vendor-neutral environments based on industry and defacto standards. Due to large investments in legacy systems, carefully planned migration paths are critical. The task is complicated by a still-maturing technology and unstable standards.

16._____ _____ Determining appropriate IS funding levels

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

17._____ _____ Facilitating and managing 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.

18._____ _____ Increasing understanding of IS role and contribution

IS is often viewed as an operational activity with little recognition of its strategic contribution to the organisation. This can result in executive management viewing IS strictly as an overhead expense. Funding can be cut resulting in missed opportunities for using IT to solve important business problems.

19._____ _____ Integrating data processing, office automation, and telecommunications

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

20._____ _____ Managing data and document storage

Information stored in both electronic and hardcopy form is accumulating at a staggering pace. There is a need to provide for future data and document storage requirements.

21._____ _____ Planning and managing communications networks

Communication is the lifeblood of the organisation. Using IS for competitive advantage depends heavily on access to appropriate internal and external communication networks. This task is complicated by rapid advances in underlying technology and major structural changes in the communications industry.

22._____ _____ Managing the existing portfolio of legacy applications

Most organisations have a large investment in their existing applications portfolio. Some "legacy" applications may need to be retired quickly. Others may need to be leveraged for many years before they are replaced. Integrating new technologies and migrating new operating environments can be difficult. Too little is known about managing these problems.

23._____ _____ Using information systems for competitive advantage

In many businesses, long-term survival is dependent upon 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 IS.

24._____   _____ **Developing and managing distributed systems**
Client-server applications promise to offer a cost-effective alternative to centralised applications. Unfortunately, they present many challenges including: maintaining consistent software versions; maintaining consistent data; controlling joint development projects with users; and administering large-scale distributed applications.

25._____   _____ **Planning and managing the applications portfolio**
The applications portfolio is rapidly increasing in size, complexity, and maintenance cost. Despite the longevity of the maintenance problem, too little is known about managing it effectively.

26._____   _____ **Facilitating and managing end-user computing**
The proliferation of end-user computing through personal computers offers the promise of improved productivity but also the dangers of inadequate management control. Information systems management must balance control against the need for slack. Clarification of IS and end-user roles is a necessity.

27._____   _____ **Implementing and managing collaborative support systems**
New software is needed to support the reengineered, flat, team-based organisation of the future. Appropriate IT support can help teams share information, lead to faster decision making, and improved team effectiveness. Such support will become even more important in a distributed ubiquitous computing environment.

28._____   _____ **Educating senior management in relation to IT**
The education of senior managers in an organisation will lead to more enlightened resource allocation for IS, a more strategic view in IS planning and an understanding of IS's role in the organisation.

29._____   _____ **Planning and using CASE technology**
Significant progress has been made automating business functions within organisations; however, a vast productivity gain is possible if the automation process itself is automated. In principle, software systems can provide support for integrating the design efforts of project teams, for standardising representation methods, and for generating code. While this technology is still being refined, providing support for systems development is extraordinarily complex and will require major changes within the IS function.

30._____   _____ **Building a responsive IT infrastructure**
Building a technology infrastructure that will support existing applications while remaining responsive 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.

31._____   _____ **Establishing effective disaster recovery capabilities**
Down-side risks are increasing daily from the potential loss of business due to a disaster. Effective recovery plans must be in place and tested regularly to ensure losses are minimised As organisational applications grow and become more integrated, the greater the risk becomes.

Appendix B: Critical Scores for all Key Issues

Rank	ISSUE	Issue Category	Mean Rating	Std. Dev.
1	Building a responsive IT infrastructure	TM	7.19	1.65
2	Planning and managing communications networks	TM	6.93	1.92
3	Establishing effective disaster recovery capabilities	TM	6.88	1.66
4	Making effective use of the data resource	SDDM	6.87	1.63
5	Facilitating organisational learning	PM	6.86	1.59
6	Facilitating and managing end user computing	EUC	6.80	1.73
7	Educating senior management in relation to IT	PM	6.73	1.96
8	Using information systems for competitive advantage	SM	6.72	1.91
8	Improving IS strategic planning	SM	6.72	1.91
10	Aligning the IS organisation within the enterprise	SM	6.71	2.04
11	Developing and implementing an information architecture	SM	6.69	1.55
12	Improving information security and control	SDDM	6.64	1.65
13	Measuring IS effectiveness and productivity	TM	6.63	1.71
14	Increasing understanding of IS role and contribution	PM	6.60	2.03
15	Selecting and integrating packaged applications software	SDDM	6.55	2.03
16	Facilitating/managing executive and decision support systems	EUC	6.46	1.84
17	Improving data integrity and quality assurance	TM	6.41	1.82
18	Facilitating and managing business process redesign	SM	6.40	2.20
18	Integrating data processing, office automation, telecommunications	TM	6.40	1.88
20	Recruiting and developing IS human resources	PM	6.29	2.04
21	Improving the effectiveness of software development	SDDM	6.21	2.13
22	Developing and managing distributed systems	SDDM	6.16	2.35
23	Determining appropriate IS funding levels	SM	5.98	2.09
24	Developing and managing electronic data interchange	TM	5.84	2.01
25	Implementing and managing collaborative systems	TM	5.73	2.17
26	Managing data and document storage	TM	5.64	1.91
27	Planning and managing the applications portfolio	SDDM	5.60	1.85
28	Managing existing portfolio of legacy applications	SDDM	5.49	2.07
29	Multi-vendor open systems technologies	TM	5.41	2.27
30	Outsourcing selected information services	SM	5.24	2.41
31	Planning and using CASE technology	TM	4.39	2.21