Determining key technology and management issues for CIOs deemed to be problematic and suffering from performance gaps

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Abstract

The most important technology and management priorities considered to be problematic and challenging for the chief information officer (CIO) can be identified by determining where significant performance gaps exist for individual priorities. Previous studies have identified the key technology and management priorities for CIOs but, surprisingly, have not evaluated the performance of these priorities. In 30 in-depth interviews, CIOs rated the importance and performance of 10 key technology and 10 key management priorities identified in a previous large-scale survey of CIOs. Significant performance gaps exist for four management priorities and for four technology. Furthermore, the following technology and management priorities which exhibited performance gaps have remained constant priorities over time: align IT with business goals; IT-enabled process improvement; integrate/enhance systems and processes; and ensure data security and integrity. This research contributes to theory by identifying the most important technology and management priorities in ICT which exhibit performance gaps. Where the performance gaps exist in technology and management priorities, more attention and resources need to be dedicated by CIOs to the management of ICT, and to resolving the associated technology challenges.

Keywords
Chief Information Officer; Technology Issues in ICT; Management Issues in ICT; Performance Gaps; ICT strategy

Introduction

The role of the CIO has become increasingly complex and strategic as ICT has become an integral part of, and embedded seamlessly in, the business processes of organisations (Broadbent & Kitzis 2005; Deloitte 2004). Previous research has identified the key technology and management priorities faced by the CIO in the current business and technology environment (Broadbent & Kitzis 2005; Deloitte 2004; Grover et al. 1993). However, previous research has not identified which of these key technology and management priorities challenging CIOs suffer from performance gaps. We also believe it worthwhile to determine which key priorities for CIOs have remained constant over time, and what new priorities have emerged.

This research is concerned with determining which are the most important key technology and management priorities by identifying where a performance gap exists in ten key technology and ten key management priorities identified in a recent large-scale survey of CIOs (Prewitt & Cosgrove-Ware 2006).

This paper is structured as follows. First, a number of definitions of the CIO role are provided and the CIO role is defined for the context of our study. Then, we provide an overview of a large-scale previous study conducted almost a decade ago (Pervan 1998) which identified the key technology and management priorities of CEOs and CIOs. In contrast, the key technology and management priorities identified in a recent large-scale survey of CIOs (Prewitt & Cosgrove-Ware 2006) are presented and compared with the study by Pervan (1998). Next, the research objectives and questions are presented and the methodology employed for data collection and analysis is explained and justified. The findings of the quantitative data analyses are presented and then discussed. Finally, the main conclusions on the results of this

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study are presented and the implications of these findings for research and practice are outlined.

Background to this research

Chief information officer (CIO) is a term that emerged in the 1970s as a result of the increased importance placed on IT by organisations (Gottschalk 1999; Rockart, Ball & Bullen 1982; Stephens & Ledbetter 1992). CIO is a job title commonly given to the most senior IT executive in an organisation responsible for the management of the ICT infrastructure that supports organisational goals. Broadbent and Kitzis (2005) offer a more recent definition: 'the most senior executive responsible for identifying information and technology needs and then delivering services to meet those needs'.

In considering how the role of the CIO has changed over time, it is useful to look back at past studies of the key technology priorities and managerial priorities faced by the CIO. This retrospection will allow us to critically evaluate whether and how the role has changed over time in response to changing technology and management priorities in ICT. Indeed, the ICT function has evolved and changed significantly in response to key historical eras of ICT centralised mainframe computing—where the focus was on transaction processing; decentralised client server computing; end user applications and networked computing; and centralised computing through enterprise applications (Farhoomand 2005). A forty year longitudinal study of the corporate IT function and the role of the CIO at Texaco shows how the role of the CIO has changed in response to a changing technology and business environment (Hirschheim, Porra & Parks 2003). It is thus not surprising that researchers have argued for over a decade or more that the role of the CIO is changing (Deloitte 2004; Tagliavini, Moro, Ravarini & Guimaraes 2004; Gottschalk 2000; Korn/Ferry International 1998; Pervan 1998) and that the technology and management issues and priorities for CIOs will likewise change over time.

Past research has argued that the role of CIO has evolved in four distinct stages (Weiss & Anderson 2004). In the first instance, CIOs were seen as 'glorified DP (data processing) managers'. In the second stage of evolution, CIOs were cast as technocrats. CIOs became business executives in the third stage of evolution. The fourth stage of evolution characterizes CIOs as both technocrats and business executives. In line with this technological evolution, a number of more recent studies suggest that the role of the CIO has changed significantly from the technology 'steward' to the senior executive responsible for aligning ICT with the business goals and leveraging ICT to achieve the strategic vision of an organisation (Broadbent & Kitzis 2005; Deloitte 2004; Korn/Ferry International 1998). Indeed the technology 'steward' role has been split from the CIO role, with many organisations having a chief technology officer (CTO) responsible for the planning and implementation of ICT. Hence, the CIO role has become much more strategic—with the CIO increasingly sitting on the executive management board in many organisations. As ICT has become more important, the CIO has come to be viewed in many organizations as a key contributor in formulating strategic goals. In many companies, the CIO reports directly to the Chief Executive Officer (CEO). In some companies, the CIO sits on the executive board (Deloitte 2004; Korn/Ferry International 1998). Typically, the CIO delegates technical decisions to employees more familiar with details. Usually, a CIO proposes the information technology and communications

infrastructure that an organisation will need to achieve its goals and then works within a budget to implement the plan.

A number of past studies have attempted to capture the complexity and diversity of the CIO role by categorising the distinct roles that the CIO performs (see Table 1). Table 1 provides a summary of a number of studies on the role of the CIO and indicates how complex and varied the role of the CIO has become in evolving from a purely technical focus during the 1970s and 1980s to a much broader managerial and strategic focus in the 1990s and 2000s, as indicated in the studies represented in Table 1.

Table 1 Summary key studies which have examined the changing role of the CIO

	Feeny 1997	Gottschalk 1999	Tagliavini et al 2004	Laptone & Bain 2005	Broadbent & Kitzis 2005
ICT infrastructure management	Yes	Yes	Yes	Yes	Yes
Relationship management	Yes				Yes
Change management		Yes		Yes	Yes
Interpersonal skills			Yes		Yes
ICT Human resource management		Yes	Yes	Yes	Yes
ICT service delivery	Yes				Yes
Business Strategist	Yes	Yes	Yes	Yes	Yes

(Source: developed for this research)

In summary, past research on the role of the CIO has categorised the key functions in ICT into five sub functions:
(1) ICT human resource management;
(2) strategic management of ICT;
(3) operational management of ICT;
(4) relationship management of ICT; and
(5) organisational management
enabled through ICT (Tagliavini, Moro, Ravarini & Guimaraes 2004). The complexity of ICT functions reflects the diverse nature of responsibilities in the role of the CIO. Hence, it is not surprising that the CIO has been faced with a number of long term challenges in relation to key technology and management issues.

Key technology and management issues for the CIO role

This research paper focuses on key issues which are considered important and challenging for CIOs in the current technological and business environment. A comprehensive list of technology, strategic, people and support management, and systems development and data management issues accepted as major ongoing

priorities for CEOs and CIOs were identified in a previous study (Pervan 1998). Four hundred and fifty-two Australian organisations were surveyed on this range of technology and management issues in ICT, and the CEOs and CIOs were asked to rate four different categories of issues (technology management; strategy management; people and support management; and systems development and data management) in terms of their importance for their organisation.. Our justification for comparing the results of the Pervan (1998) study with this research is that we believe that the CIO role has become increasingly strategic in many organisations. It should also be noted that our study is not as wide in scope as the Pervan (1998) study which looked at the perceptions of both the CIO and CEO towards the key technology and management issues associated with ICT.

The CIO sits on the executive board and provides advice and guidance on how ICT can enable and deliver business strategies and goals (Broadbent & Kitzis 2005; Deloitte 2004). Indeed, situations now exist where CIOs have become the CEOs of large multinational corporations. We reclassified the four categories of key priorities challenging CIOs and CEOs from Pervan's (1998) study into the more general classification of technology and management priorities to enable comparison of the key priorities challenging CIOs a decade ago with the current top technology and management priorities. Interestingly, some of the items classified by Pervan (1998) in these four categories have been reclassified into different categories by the authors. For instance, we believe that 'managing IS effectiveness and productivity' is an ICT management priority, rather than a technology priority. Similarly, we reclassified some of the systems development and data management category items into technology or management priorities. Tables 2 and 3 show the ten most important technology and management issues in ICT over the next 3-5 years identified by CIOs and CEOs respectively in 1998, and the categorisation used for each issue in 1998 and 2006.

Table 2 Top ten technology and management priorities identified by CIOs in 1998

Rank and Issue	Category 1998	Category 2006	Mean	SD
1. Building a responsive IT infrastructure	TM	TP	7.04	1.64
2. Measuring IS effectiveness and productivity	TM	MP	6.88	1.67
3. Making effective use of the data resource	SDDM	TP	6.91	1.70
4. Planning and managing computer networks	TM	TP	6.58	1.68
5. Using IS for competitive advantage	SM	MP	7.12	1.72
6. Improving IS strategic planning	SM	MP	6.51	1.74
7. Facilitating organizational learning	PSM	MP	6.76	1.50
8. Establishing effective disaster recovery systems	TM	TP	6.63	1.87
9. Aligning the IS organisation within the organisation	SM	MP	6.07	2.03
10. Improving information security and control	SDDM	TP	6.59	1.71

(Source: adapted from Pervan 1998) Legend TM = Technology management; SDDM = System development and data management; Strategic management = SM; People and support management = PSM; Management priority = MP; Technology priority = TP;

The technology priorities were found to be of higher concern for CIOs in 1998 with three of the top four priorities being technology priorities when we applied the classification used in this study.

Table 3 Top ten technology and management priorities identified by CEOs in 1998

Rank and Issue	1998 Category	2006 Category	Mean	SD
1. Using IS for competitive advantage	SM	MP	7.12	1.72
2. Building a responsive IT infrastructure	TM	TP	7.04	1.64
3. Making effective use of the data resource	SDDM	TP	6.91	1.70
4a. Measuring IS effectiveness and productivity	TM	MP	6.88	1.67
4a. Developing and implementing an information architecture	SM	TP	6.88	1.57
4a. Facilitating/managing executive and decision support systems	PSM	TP	6.88	1.81
7. Improving the effectiveness of software development	SDDM	TP	6.81	1.90
8. Facilitating organizational learning	PSM	MP	6.76	1.50
9. Facilitating and managing business process redesign	SM	MP	6.72	1.63
10. Establishing effective disaster recovery capabilities	TM	TP	6.63	1.87

Legend TM = Technology management; SDDM = System development and data management; Strategic management = SM; People and support management = PSM; Management priority = MP; Technology priority = TP;

Interestingly, the top four priorities for CEOs in 1998 were equally split between management and technology priorities when we apply the classification used in this study.

Recent literature suggests that the CIO role has changed significantly in the last ten years. The CIO role has become much more strategic and often the CIO is a member of the executive management team (Broadbent & Kitzis 2005; Tagliavini, Moro, Ravarini & Guimaraes 2004; Deloitte 2004). Hence, we believe this change to a more strategic focus in the role of the CIO should be reflected in the types of technology and management priorities that CIOs consider to be important in the current business environment.

We sought to confirm and quantify the key technology and management issues that are priorities for today's CIOs and compare these top technology and management priorities against the findings of past empirical studies, such as Pervan (1998), of the CIO role. We adapted the top ten key technology and management issues identified as priorities in an extensive survey study of CIOs in 2005 (Prewitt & Cosgrove-Ware 2006). CIO.com has conducted the State of the CIO survey annually since 2002 (www.cio.com/state). The survey for the State of the CIO 2006 report was conducted in 2005 and the results published from this survey are based on the responses of IT CIOs, Chief Technology Officers (CTOs) and Vice Presidents in 500 organisations. The State of the CIO 2006 report provided a list of the top 10 technology priorities and a list of the top 10 management priorities identified as being the most important technology and management issues facing CIOs in 2006 and beyond (Prewitt & Cosgrove-Ware 2006).

These top ten technology priorities and top ten management priorities facing CIOs in 2006 are listed in Tables 4 and Table 5. We have also purposively indicated whether these issues were identified as priorities in the previous study by Pervan (1998).

Table 4 Top ten technology priorities identified by CIOs in 2005)

Technology Priority

Technology Priority	**Identified as important by Pervan 1998**
1. Integrate/enhance systems and processes	Yes
2. Ensure data security and integrity	Yes
3. Enable business intelligence	No
4. External customer service/relationship management	No
5. Redesign or rationalise the IT architecture	No
6. Enable or enhance e-commerce/e-business	No
7. Enable mobile/wireless	No
8. Deploy web services	No
9. Automate or optimise supply chain	No
10. Scale IT globally	No

(Source: adapted from Prewitt & Cosgrove-Ware 2006)

Not surprisingly, only two of the top ten technology issues have remained priorities for CIOs a decade later. These were integrate/enhance systems and processes, and ensure data security and integrity.

Table 5 Top ten management priorities identified by CIOs in 2005

Management Priority	Identified as important by Pervan 1998
1. Align IT and business goals	Yes
2. Business continuity/risk management	Yes
3. Control IT costs	No
4. Improve internal user satisfaction	No
5. IT enabled process improvement	Yes
6. Develop IT staff/leadership/business skills	Yes
7. Improve project management discipline	No
8. Ensure privacy of customer and employer data	No
9. Enable or enhance knowledge management and leverage intellectual assets	Yes
10. Ensure regulatory compliance	No

(Source: adopted from Prewitt & Cosgrove-Ware 2006)

Interestingly, half of the key management issues for CIOs have remained priorities over the last decade since Pervan's 1998 study, while the other half are management issues which have emerged as priorities for CIOs in response to the rapid pace of change in the business and technology environment of the 21st century.

There is no doubt that the majority of these top ten technology and management issues identified as priorities in the State of the CIO survey (Prewitt & Cosgrove-Ware 2006) would be considered important by most large organisations who have significant investment and reliance on ICT infrastructure. However, in this research, we sought to delve deeper with regard to these top ten technology and management priorities and find out how important these were considered by CIOs across a range of industry sectors, and how well organisations were performing in delivery/application of these technology and management priorities. In other words, we wanted to find out which of the top ten technology and management issues were problematic and challenging for CIOs by confirming if there was a performance gap between the importance and priority given by CIOs to a technology or management issue and delivery/application of these technology and management priorities in organisations.

Research questions and method

The research questions we investigated and report on in this paper are aligned with three objectives of a study on the changing role of the CIO. These objectives were:

Confirm which are the most important technology and management priorities for CIOs in the current business and technology environment;
Determine to what extent these technology and management priorities have remained constant over time; and
Identify whether a performance gap exists between the importance of these technology and management priorities of CIOs and delivery/application of these priorities in organisations.

These research objectives were translated into three specific research questions as follows:

Research question 1: How important do you consider these top ten technology and management issues?

Research question 2: How well are these technology and management issues being performed in your organisation?

Research question 3: To what extent have these technology and management issues remained constant priorities over time?

The research method used to collect and analyse the data in relation to the above three research questions was primarily quantitative. Interview informants (CIOs) were purposively selected from 30 large organisations with significant investment and reliance on ICT across a range of industry sectors (see Table 6) which have traditionally been heavy users of ICT.

These CIOs were the highest ranking IT executive in the organisation and reported no lower than two levels below the CEO (that is, either reported directly to the CEO or to one of the CEO's direct reports). They were also responsible for the strategic planning of IT/IS in the organisation, typically in a managerial role requiring effective communication with senior management, having a corporate perspective in managing ICT infrastructure, and having influence in the business strategy of their organisation (Grover Jeong, Kettinger & Lee 1993; Stephens, Ledbetter, Mitra & Ford 1992). The experience of interview informants in their current CIO role varied from 6 months, to one informant who had been in the CIO role in the same organisation for more than 10 years. The majority of the CIOs in the study have been in the role for 2-3 years.

The interview informants (CIOs) were asked to rate the top ten technology and management priorities listed in Tables 3 and 4 of this paper on a Likert scale of low, medium and high in terms of their importance to their organisation. The researchers personally explained the purpose of rating these priorities to each CIO to avoid any misunderstanding or confusion regarding the list of technology and management priorities to be rated. The interview informants (CIOs) were then asked to rate the performance of these top ten technology and management priorities in their organisation.

The responses of the CIOs in relation to these ten top technology and management priorities in terms of importance and performance are presented as the mean and standard deviation for each technology and management priority. Given the small size of the data set (30 CIO responses), it was appropriate to use the non parametric Wilcoxon Matched-Pairs Signed-Ranks Test to determine if there was a difference overall between the quantitative ratings by the CIOs in relation to the importance and performance of the top ten technology and management priorities in their organisations. The Wilcoxon Matched-Pairs Signed-Ranks Test allowed comparison of the two related pairs of responses by the interview informants (CIOs) to test if the

two responses (importance; performance) for each technology and management priority were different (Zikmund 1998; Coakes 2005).

Results of data analysis

Demographics of the interview informants and their organisations is summarised in Table 6 in relation to type of industry, degree of reliance on ICT and degree of investment in ICT.

Table 6 Demographics of organisations of the CIOs that participated in interviews by industry

Industry	Number of organisations	Reliance on ICT	Investment in ICT
Higher education	9	High	High
Banking & Finance	6	High	High
Utilities	4	High	High
Transport	2	High	High
Media	1	High	High
Government	1	High	High
Mining	2	Medium	Medium
Manufacturing	2	Medium	Medium
Tourism	1	Medium	Medium
Health	1	Medium	Medium
Pharmaceutical	1	Medium	Medium
	30		

(Source: developed for this research)

Table 7 shows the ranking of the ten technology priorities by CIOs in terms of importance and performance in organisations.

Table 7 Importance and performance of ten most important technology priorities ranked by performance gap in 2006

Top ten technology priorities	N	Importance (Mean)	Performance (mean)	Std. Dev	Performance gap?	Identified priority by Pervan (1998)
Customer service/relationship management	26	2.63	(2.04)	.60	Yes	No
Integrate/enhance systems and processes	26	2.70	(2.12)	.60	Yes	Yes
Business Intelligence	26	2.42	(1.85)	.68	Yes	No
Data security/integrity	26	2.83	(2.37)	.56	Yes	Yes
Automate/optimise Supply chain	24	1.90	(1.63)	.71	Yes	No
Deploy Web services	26	2.20	(2.04)	.72	Yes	No
Enable mobile/wireless	25	1.85	1.82	.75	No	No
Enable E-business	25	2.00	2.00	.71	No	No
Scale IT globally	25	1.63	1.64	.70	No	No
Redesign/rationalise ICT architecture	26	2.28	2.46	.51	No	No
Valid N (listwise)	24	*(High = 3, Medium = 2, Low = 1)*				

(Source: developed for this research)

Table 8 shows where the performance gap (difference between importance and performance) is significant, using the Wilcoxon Matched-Pairs Signed-Ranks Test, for the ten top technology priorities evaluated in terms of importance and performance by CIOs in this study.

Table 8 Top ten technology priorities ranked in order of most significant performance gap

Technology Priority	Performance Gap	Negative ranks	Positive ranks	Ties	Significance
Enable business intelligence	Yes	14	0	12	.000 **
External customer service/relationship management	Yes	15	1	10	.001 **
Integrate/enhance systems and processes	Yes	17	3	6	.002 **
Ensure data security and integrity	Yes	13	1	12	.009 **
Deploy web services	Yes	9	1	16	.059 ns
Enable or enhance e-commerce/e-business	No	7	3	15	.206 ns
Automate or optimise supply chain	Yes	8	4	12	.356 ns
Redesign or rationalise the IT architecture	No	7	8	11	.651 ns
Enable mobile/wireless	No	8	5	12	.712 ns
Scale IT globally	No	5	5	15	.782 ns

(Source: developed for this research)

Table 9 shows the ranking of the top ten management priorities by CIOs in terms of performance gap in organisations.

Table 9 Top ten most important management priorities ranked by size of performance gap

Top ten management priorities	N	Importance (mean)	Performance (mean)	Std. Dev	Performance Gap	Identified priority by Pervan (1998)
Enable/enhance knowledge management/leverage intellectual assets	26	2.37	(1.77)	.65	Yes	Yes
Align IT & business goals	26	2.90	(2.42)	.64	Yes	Yes
Develop IT staff/leadership/business skills	26	2.60	(2.14)	.66	Yes	Yes
Business Continuity/risk management	26	2.70	(2.35)	.56	Yes	Yes
Ensure regulatory compliance	26	2.70	(2.46)	.65	Yes	No
IT enabled process improvement	25	2.37	(2.08)	.57	Yes	Yes
Improve project management discipline	26	2.40	(2.19)	.69	Yes	No
Control IT costs—rating	26	2.40	(2.35)	.63	Yes	No
Improve internal user satisfaction	26	2.47	(2.35)	.56	Yes	No
Ensure privacy customer & employer data	26	2.60	2.7	.45	No	No
Valid N (listwise)	25	*(High = 3, Medium = 2, Low = 1)*				

(Source: developed for this research)

Table 10 shows where there was a significant statistical difference, using the Wilcoxon Matched-Pairs Signed-Ranks Test, between the importance and performance rankings given to each management priority by CIOs interviewed in this study.

Table 10 Top ten management priorities ranked in order of most significant performance gap

Management Priority	Performance Gap	Negative ranks	Positive ranks	Ties	Significant
Align IT and business goals	Yes	12	0	14	.001 **
Enable or enhance knowledge management and leverage intellectual assets	Yes	15	1	10	.001 **
Develop IT staff/leadership/business skills	Yes	14	2	10	.004 **
IT enabled process improvement	Yes	9	1	15	.011 *
Ensure regulatory compliance	Yes	6	1	19	.059 ns
Business continuity/risk management	Yes	10	2	14	.065 ns
Improve project management discipline	Yes	12	6	8	.182 ns
Improve internal user satisfaction	Yes	9	5	12	.285 ns
Control IT costs	Yes	7	5	14	.564 ns
Ensure privacy of customer and employer data	Yes	4	4	18	1.000 ns

(Source: developed for this research)

Discussion of data analysis results

In this study, we identified for the first time, the significant performance gaps which exist in four top technology priorities and four top management priorities facing CIOs. This finding and our evidence that two technology issues and five management issues have remained constant priorities for CIOs over the last ten years are the most important results of this investigation of the key technology and management priorities in ICT challenging the CIO role. Furthermore we confirmed which technology and management issues are the most important priorities for CIOs.

The results presented in Table 8 show that significant performance gaps exist for the following technology issues which are considered priorities by CIOs: Enable business intelligence; External customer service/relationship management; Integrate/enhance systems and processes; and Ensure data security and integrity.

Enabling business intelligence through the implementation of business intelligence systems is a major challenge for CIOs and organisations. Implementing a business intelligence system is a major undertaking for an organisation and the success of such an endeavour relies on having the right ICT infrastructure in place (for example, a data warehouse). The complexity of business intelligence systems continues to grow with increasing demand for information at all levels of business, new data and presentation formats and expertise needed to develop and maintain these enterprise wide business intelligence applications (Watson, Wixom, Hoffer, Anderson-Lehman & Reynolds 2006; Bonde & Kuckuk 2004).

External customer service/relationship is another important issue for CIOs as organisations need to become increasingly customer centric and focused in order to differentiate themselves in a highly competitive market place. Organisations have realised the value of identifying their most profitable customers and endeavouring to

lengthen the lifetime of their relationship with their most profitable customers (Ang & Buttle 2006; Blery & Michalakopoulos 2006). ICT has a major role to play in capturing and making critical customer information available at the various touch points with the customer. The cost of acquiring new customers is a considerable cost, so if organisations develop closer relationships and provide better service to their customers through the innovative use of ICT and CRM systems there are significant benefits to be realised by organisations (Ang & Buttle 2006; Jenkins 2006).

Another technical challenge for CIOs and organisations is the need to integrate and enhance information systems and business processes, both within and across organisations. Increasingly, organisations need to connect and share information between disparate systems often operating on different platforms and with different data structures (Bieberstein, Bose, Walker & Lynch 2005). Furthermore, for those organisations expanding their business through corporate acquisitions, integrating systems acquired in expansion poses many challenges. Standardising an organisation's ICT infrastructure with a service oriented architecture approach is gaining momentum in industry as a way to deal with this ongoing problem of system and business process integration, whilst still remaining agile and responsive to changes in the business environment (Moinuddin 2007; Cox & Kreger 2005;).

Data integrity and security. Given that organisations have opened up their operational systems to key suppliers and partners, there is increased pressure on the CIO from both within an organisation and from regulatory bodies (for example, the financial services sector and, at the national and international level, regulatory compliance such as Sarbane Oxley) within specific industries to ensure the integrity and security of core and critical business data and information for good corporate governance (IT Security Expert Advisory Group 2006; Kaarst-Brown & Kelly 2005).

The results listed in Table 10 show that significant performance gaps exist for the following management issues which are considered priorities by CIOs, namely: align IT with business goals; enable or enhance knowledge management and leverage intellectual assets; develop IT staff leadership/business skills; and IT-enabled process improvement.

Aligning IT with business goals is an ongoing issue which has been identified in numerous previous studies over a long period of time as an issue of concern (Luftman, Papp & Brier 1999; Henderson & Venkatraman 1996; King 1995). The findings of this study indicate that aligning IT with business goals is still a major challenge for CIOs in 2007.

Managing and developing ICT human resources is also a major challenge for CIOs and has been identified as a major concern of CIOs over a long time period in numerous previous studies (Pervan 1998; Tagliavini, Moro, Ravarini & Guimaraes 2004; State of the CIO Survey 2006). This ICT skills shortage has been exacerbated by the recent downturn in the IT industry in 2002-05 and this has had a flow-on effect resulting in the current difficulty in attracting students to study IT degrees. Indeed, there is a perception by the general public that IT has become a dead end job and, increasingly, is seen as a commodity and a strong candidate for off-shoring (Lane & Van der Vyver 2006; Van der Vyver & Lane 2006). The majority of the CIOs

interviewed in this study expressed a concern that they were facing a critical IT skills shortage, either now or in the near future, as a result of these factors.

Knowledge management still presents a major challenge for organisations despite an increase in the availability of tools and technologies which suppositively support and facilitate knowledge management. Indeed, some would argue that it is impossible to manage knowledge as it only exists in people's minds (Wisdon 2002) and it is a term popularised by consultants. Given that there is no clear agreement in the existing literature on what actually constitutes knowledge management, it is not surprising that CIOs and organisations are struggling to manage knowledge through the use of ICT.

Enabling and improving business processes through the use of ICT continues to be a major challenge for CIOs in many organisations, despite business process improvement being high on the agenda of many organisations for a long time (Hung 2006; Lambert & GarcÃa-Dastugue 2005). The term business process management is used to describe approaches within organisations which aim to improve business processes, often aided through the use of technology. The use of ICT can streamline the flow and exchange of critical information in business processes, thereby eliminating double entry and redundant information. By identifying where critical information is not currently being collected in a business process using business process modelling, it can reduce potential risks that currently exist in business processes in organisations that are unaware of the dramatic consequences (Roseman & zur Muehlen 2005).

The results displayed in Table 8 show that the technology issues:
(a) Integrate/enhance systems and processes; and (b) data security and integrity have remained priorities for CIOs over the last decade. Furthermore, both of these technology priorities exhibit significant performance gaps, indicating that both of these issues have remained problematic for CIOs over a long period of time. The results in Table 10 show that the management issues: (a) enable/enhance knowledge management and leverage intellectual assets; (b) align IT with business goals; (c) Develop IT staff leadership and business skills; (d) Business continuity/risk management; and (e) IT-enabled process improvement have remained priorities for CIOs over the last decade. Furthermore, with the exclusion of business continuity/risk management, all of these management priorities exhibit significant performance gaps and have remained problematic for CIOs for a long period of time.

Future research

Future work extending this research is encouraged in a number of directions. Firstly, each of the technology and management priorities which exhibit performance gaps are prime candidates for future research, given that CIOs have indicated these are important issues and are currently challenging and problematic for CIOs. A large scale survey of CIOs regarding the importance and performance of each technology and management priority would allow researchers to identify clearly where these priorities differ in importance and performance across industry sectors. Lastly, it would be also useful to determine where there are significant relationships between specific technology priorities and management priorities.

Conclusions and implications

Our study has identified the most important technology and management priorities in ICT which show performance gaps. Our study also confirmed that the majority of key technology issues which are priorities for CIOs have changed over the last ten years, but half of the most important management issues which are priorities for CIOs have remained constant over the last decade. These priorities continue to challenge CIOs in the current business environment and should be a important consideration in formulating ICT strategy. Where performance gaps exist, more attention and resources need to be allocated by CIOs to the management of ICT and resolving the associated technology challenges.

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