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Critical Issues of Information Systems Management in Hong Kong SAR

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Abstract

This paper discusses the perceived importance of 24 critical issues of information systems management of Chief Information Officers (CIOs) in Hong Kong in 1999 and in 2004. The research instrument was adapted from a well-established questionnaire developed in the US. "Improving the Effectiveness of Software Development" and "Building a Responsive IT Infrastructure" are the top concerns for CIOs, while five out of the top ten issues relate to IT and business relationship. Although the average score on the importance of critical issues in 2004 is rising, "Outsourcing Selected Information Services" and "Facilitating/Managing Decision and Executive Support Systems" are gaining higher importance. Comparing results with the latest studies in the US, Australia and Taiwan as well as previous studies in Hong Kong also help to identify issues of common concern, trends and implications. The critical issues study not only suggests some general directions and emphasis for IS executives and general managers to compare and contrast their own concerns against their peers, but also reinforces the needs for continuing revision of education programs in teaching and research to reflect the views of IS executives.

Keywords: Critical issues, Information Systems Management, Hong Kong, United States

1. Introduction to the Critical Issues of Information Systems Management

An Information Systems (IS) manager or CIO, who is managing the IS or Information Technology (IT) function of an organization, will certainly have encountered problems in the development of information systems plans. They should be concerned with the need to consider those IS management issues, which are thought to be the most important in this era of dynamic change. A number of studies on critical issues of IS management have been published reflecting CIO's concerns in the US since 1980 (Ball and Harris, 1982). Similar studies were replicated in other parts of the world such as Hong Kong (Burn et al, 1993; Moores, 1996), Australia (Watson, 1989; Pervan, 1997), Europe (Dexter et al, 1993; Galliers, Merali and Spearing, 1994) and other Asian countries (Harrison and Farn, 1990; Palvia and Palvia, 1992; Wang and Turban, 1994; Yang, 1996). The investigation of critical IS management issues serves to enhance an understanding of the concerns of IS/IT management and to provide

guidance to CIOs and senior management in the planning and control of these issues. Since IT is still a developing industry in Hong Kong, an interesting research question is whether the results of the current study will be significantly different from prior studies (Burn, et al, 1993; Moores, 1996), especially after the change of sovereignty from the U.K. to China in 1997? By comparing the results of this survey with similar studies in the US, Australia and in Republic of China (Taiwan), we can also address another research question of whether the results from our study will be significantly different from other Asian-Pacific countries.

2. Review of Previous Studies

Ball and Harris (1982) identified that "IS long-range planning and integration with corporate plans", "gauging IS effectiveness", "the developing role of the information resources manger", "decision support systems and user education" were the most important IS issues. Dickson, et al. (1984) used Delphi survey approach to identity the ten most important IS management issues as perceived by leading IS professionals (mostly practitioners and some academics). Management issues which include "improved IS planning", "facilitation and management of end user computing", "integration of data processing", "office automation and telecommunications", "improved software development and quality", "measuring and improving IS effectiveness/productivity" were regarded as the top issues in the early 1980s (Dickson et al, 1984). His approaches had been replicated every three to four years (Brancheau and Wetherbe, 1987; Niederman et. al, 1991; Watson and Brancheau, 1993; Brancheau et al, 1996). Seven out of the top ten issues in the 1983 study remained in the 1986 study (Brancheau and Wetherbe, 1987). "Creating competitive advantage", "IS's role and contribution", "developing information architecture", "enhancing software development quality" and "developing decision support systems" were among the top ten issues. In general, managerial issues were ranked more important than technical issues.

Table 1. A Comparative Views of IS Issues in the US over the 80s
(Source: Burn et al, 1993, p. 29)

Issue	US Ranking of Key Issues Over Time			
	1980 (Ball and Harris, 1982)	1983 (Dickson et al, 1984)	1986 (Brancheau & Wetherbe, 1987)	1989 (Niederman et. al, 1991)
Developing information architecture	-	-	8	1
Utilization of data resources	4	9	7	2
IS strategic planning	1	1	1	3
IS human resources	7	8	12	4
Organizational learning	8	6	3	5
Building IT infrastructure	-	-	-	6
IS organization alignment	9	7	5	7
Creating competitive advantage	-	-	2	8
Software development quality	13	4	13	9
Telecommunication systems	3	13	11	10

Three years later, only six of the top ten issues in 1986 remained in 1989 study (Niederman et. al, 1991). "Technology infrastructure" became more important though traditional issues such as "strategic planning" and "organizational alignment" remained to be important. "IS human resources" became more important while internal effectiveness issues made a strong comeback after being ignored in 1986. A comparative view of IS management issues in the US in the 1980s is summarized in Table 1, which shows that business relationship issues have dominated the top ten throughout the 1980s.

IS issues studies have been widely conducted in other parts of the world in the 1990s whilst comparing the findings with the US findings. Harrison and Farn (1990) conducted surveys in US and in Taiwan in 1989. It was found that CIOs in both Taiwan and US had similar concerns for the current period but with different concerns five years later. Results from both studies showed that management issues (i.e. training end users, improving IS productivity, improving productivity of maintenance services, IS staff development and enhancing competitive advantages) were ranked as important issues. Further to Harrison and Farn (1990)'s study, Wang and Turban (1994) conducted IS issues in Taiwan in 1992. The Taiwanese organizations continued to place higher priorities to management issues overall. However, it was found that there were significant differences between each industry groups as well as the size of companies. For example, large financial services firms gave higher priorities to IS personnel development, insufficient human resources, software development productivity and end-user computing. Conversely, the small financial services companies put lower priorities to competitive advantage, IS personnel development and user participation. Yang (1996) conducted another survey in Taiwan in 1994. Results listed in Table 2 showed that there were less differences between the 1989 study and that of the 1992 study.

Table 2. A Comparative Views of IS Issues in Taiwan from 1989 to 1994

Issue	Taiwan Ranking of Key Issues Over Time		
	1989 (Harrison & Farn, 1990)	1992 (Wang & Turban, 1994)	1994 (Yang, 1996)
Top management support	3	7	1
Communications with end-users	6	6	2
Goal alignment	1	3.5	3
Creating competitive advantages	2	1	4
Systems integration	5	5	5
Software development quality	7	9	6
IS human resources	3	20	7
IS budgeting	12	-	8
Measuring IS productivity	8	18.5	9
Providing better hardware/software	10	-	10

Several studies were also conducted in Australia with the latest one by Pervan (1997) in 1996. As shown in Table 3, the ten most critical issues ranked by CIOs in Australia appeared to address similar issues as found by Niederman et. al, (1991).

Table 3. CIO's Ranking for all Key IS Management Issues in Australia
Source: Pervan (1997)

Rank	Issue
1	Building a responsive IT infrastructure
2	Making effective use of the data resource
2	Educating senior management in relation to IT
4	Planning and managing communications networks
5	Using information systems for competitive advantage
6	Improving IS strategic planning
7	Facilitating organisational learning
8	Establishing effective disaster recovery capabilities
9	Aligning the IS organisation within the enterprise
10	Improving information security and control

There were two previous studies of critical IS issues conducted in Hong Kong. Burn, et al. (1993) conducted a survey in 1990 when "IS human resources" was ranked as the most

critical issue. The other issues were similar to studies conducted in Australia, European and US. Although Singapore and Hong Kong appeared to have shared many commonalities in terms of size and business environment, the critical issues were rather different for both cities. Perhaps, the political environment was the contributing factor. In another study conducted in Hong Kong (Moores, 1996), "improving software development quality", "using data resources", "IS strategic planning", "developing an information architecture" and "creating competitive advantage" were of high importance. These two studies would be elaborated further when comparing the results of this study.

Watson and Brancheau (1991) compared and contrasted the key IS management issues studies conducted in the late 1980s in Australia, Europe, the US, and Singapore. IS executives in the former three countries showed a reasonable level of agreement on the most critical issues and they placed high emphasis on long-range perspective on their functions such as "IS strategy planning", "IS organizational alignment", "creating competitive advantages", "IS's role and contribution". Singaporean IS executives were more concerned with measurement, control and technology issues such as "measuring effectiveness", "end-user computing", "security & control" and "integrating technology". This could be partly explained by the relative newness of information systems in Singaporean organizations.

The study of key issues in IS management by Brancheau, et al. (1996) revealed that the technology infrastructure issues continued as a strong trend since 1990 while business relationship issues had declined in importance. "Building a responsive IT infrastructure", "developing and managing distributed systems", "developing and implementing an information architecture" and "planning and managing communications networks" were in the top IS issues.

3. Research Design and Survey

Our questionnaire was adapted from Brancheau et al. (1996)'s findings. Twenty-four critical issues of IS management were grouped under four classifications (see Table 4): Business Relationship (BR), Internal Effectiveness (IE), Technology Application (TA) and Technology Infrastructure (TI). The BR group (7 issues) mainly concerns with the IS department and the business, while the TI group (6 issues) concerns with the facilities needed to support the use of IT. The IE group (7 issues) and TA group (4 issues) have a narrower focus and relate specifically to how well the IS department performs certain key functions. These classifications are meant to provide explanation on the major concern of the organizations under study. Furthermore, they are also grouped under M/T (12 Management issues versus 12 Technology issues), P/C (4 Planning issues versus 20 Control issues) and I/E (10 Internal issues versus 14 External issues) in order to provide analyses from multiple perspectives.

Our survey instrument is shown in Appendix 1, which provides detailed descriptions of each of the critical issues of IS management. Respondents were requested to rate each issue on a scale from 1 to 10, where 10 indicates his/her most important issue(s) and 1 indicates his/her least important issue(s). Apart from the 24 issues as listed in Appendix 1, respondents were also requested to write down other important issues and their respective ratings.

Table 4. Classification of IS Management Issues

Classification	Issue	M/T	P/C	I/E
Business Relationship (BR)	Aligning the IS Organization within the Enterprise	M	C	E
	Facilitating and Managing Business Process Redesign	M	C	E
	Facilitating Organization Learning	M	C	E
	Improving IS Strategic Planning	M	P	E
	Increasing Understanding of IS Role and Contribution	M	P	E
	Making Effective Use of the Data Resource	M	C	E
	Using Information System for Competitive Advantage	M	P	E
Internal Effectiveness (IE)	Establishing Effective Disaster Recovery Capabilities	T	C	I
	Improving Information Security and Control	T	C	I
	Improving the Effectiveness of Software Development	T	C	I
	Managing the Existing Portfolio of Legacy Applications	T	C	I
	Measuring IS Effectiveness and Productivity	M	C	I
	Outsourcing Selected Information Services	M	C	E
	Recruiting and Developing IS Human Resources	M	C	I
Technology Application (TA)	Facilitating and Managing End-User Computing	M	C	E
	Facilitating/Managing Decision and Executive Support Systems	M	C	E
	Implementing and Managing Collaborative Support System	T	C	E
	Planning and Using CASE Technology	T	C	I
Technology Infrastructure (TI)	Building a Responsive IT Infrastructure	T	C	I
	Developing & Implementing an Information Architecture	T	P	I
	Developing and Managing Distributed Systems	T	C	E
	Developing and Managing Electronic Data Interchange (EDI)	T	C	E
	Planning and Integrating Multi-Vendor Open System Technologies	T	C	I
	Planning and Managing Communication Networks	T	C	E

Legend: M/T = Management or Technology; P/C = Planning or Control; I/E = Internal or External

200 questionnaires were sent to members of the IT Management Club in the last quarter of 1998 and the first quarter of 1999. Most of them are CIOs or IS managers in medium/large organizations in the Hong Kong Special Administrative Region (HKSAR) of China. The questionnaire requested the participants to rate the importance of IS management issues in the current year (1998/1999) and five years ahead (2003/2004) based on a 10-point scale with 1 being least important and 10 being most important. Data of the 28 returned questionnaires (a response rate of 14%) were analyzed and compared to previous studies in Hong Kong by Burn, et al. (1993) conducted in 1990 and by Moores (1996) conducted in 1994 as well as the analysis of critical issues of IS management from an international perspective.

4. Results of the Hong Kong Survey

The 24 issues in Table 5 have been listed in descending order from most important to least important based on the average rating by the respondents for the current year (1999). This is followed by an analysis of the top ten issues in 1999 and its change of ranks over time.

Table 5. IS Management Issues – a Hong Kong Study (1999)

Critical Issues of IS Management (1999)	Mean	S.D.	Classification
1. Improving the Effectiveness of Software Development	7.57	2.27	IE
2. Building a Responsive IT Infrastructure	7.43	2.03	TI
3. Increasing Understanding of IS Role and Contribution	7.29	1.84	BR
4. Making Effective Use of the Data Resource	7.18	2.11	BR
5.5 Developing & Implementing an Information Architecture	7.11	2.11	TI
5.5 Aligning the IS Organization within the Enterprise	7.11	1.83	BR
7. Improving IS Strategic Planning	7.04	2.25	BR
8. Using Information System for Competitive Advantage	7.00	2.31	BR
9. Facilitating and Managing End-User Computing	6.96	1.90	TA
10. Managing the Existing Portfolio of Legacy Applications	6.89	1.83	IE
11.5 Measuring IS Effectiveness and Productivity	6.82	2.04	TI
11.5 Planning and Managing Communication Networks	6.82	2.34	IE
13. Improving Information Security and Control	6.80	2.47	IE
14. Facilitating and Managing Business Process Redesign	6.75	2.05	BR
15. Recruiting and Developing IS Human Resources	6.57	1.89	IE
16. Establishing Effective Disaster Recovery Capabilities	6.40	2.18	IE
17. Facilitating Organization Learning	6.32	2.44	BR
18. Implementing and Managing Collaborative Support System	6.25	2.19	TA
19. Planning and Integrating Multi-Vendor Open System Technologies	6.07	2.37	TI
20. Developing and Managing Distributed Systems	5.93	**2.49**	TI
21. Facilitating/Managing Decision and Executive Support Systems	5.88	**2.49**	TA
22. Developing and Managing Electronic Data Interchange (EDI)	5.64	**2.88**	TI
23. Outsourcing Selected Information Services	5.36	**2.50**	IE
24. Planning and Using CASE Technology	4.80	2.08	TA

Classification: BR = Business Relationship   IE = Internal Effectiveness
                          TA = Technology Application   TI = Technology Infrastructure

4.1. *Top 10 IS Management Issues of the 1999 Study in Hong Kong*

Table 6. A Comparative Views of IS Issues in Hong Kong from 1990 to 2004

Issue	Rank of Key Issues in Hong Kong			
	1990 (Burn et al, 1993)	1994 (Moores, 1996)	**1999 (current study)**	2004 (current study)
Improving software development	6.5	1	**1**	5
Building IT infrastructure	-	16	**2**	2
Increasing understanding of IS Role and contribution	-	13	**3**	13
Utilization of data resources	5	2	**4**	3
Developing information architecture	-	4	**5.5**	7
IS organization alignment	3	10	**5.5**	8
Improving IS strategic planning	2	3	**7**	4
Creating competitive advantage	6.5	5	**8**	1
Facilitating and Managing End-User Computing	-	15	**9**	16
Managing the Existing Portfolio of Legacy Applications	-	14	**10**	23

The top 10 IS management issues of the 1999 study in Hong Kong are briefly discussed below in order to provide insight into the rationale behind the issue and its relationship to other issues. The tracking of its historical ranks in 1990 and 1994 as well as its projected rank in 2004 are also presented. Table 6 shows the trend of important IS issues. Since the study in 1990 used a different research instrument for identifying the top 10 issues (instead of 24), not all the current issues can be compared.

4.1.1 Improving the Effectiveness of Software Development (Rank #1)

While the demand for IS is increasing, the application development backlog remains high. This has been a well-known but unresolved problem for 30 years! "Improving the effectiveness of software development" was ranked by CIOs in Hong Kong as the most important issue in 1994 and 1999 and it remains as one of the top ten important issues in 1990 and 2004. The effectiveness of software development can be enhanced if user requirements can be readily associated with data resource (issue #4) and supported by appropriate information architecture (issue #5). Selective end user computing in the development of reporting/inquiry applications (issue #9) may also help. Traditional development methods and platforms are no longer satisfactory but new methods and platforms have not yet proven themselves. For example, computer-assisted software engineering technologies or CASE (issue #24) was often considered as a potential solution to the backlog problem. However, the use of CASE was not highly rated by CIOs in Hong Kong (24/24), the US (20/24) and Australia (31/31). Sophisticated users are getting impatient.

Due to the continuous change of new technology platforms and the demand for new software, IT departments are required to re-skill their IT professionals and to adopt new/better software approaches, development methods/standards, quality assurance processes, and productivity tools in order to improve/maintain the effectiveness of software development.

4.1.2 Building a Responsive IT Infrastructure (Rank #2)

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. Many organizations recognized that building an appropriate technology infrastructure, which supports existing applications while remaining responsive to change, is a key to long-term enterprise productivity.

4.1.3 Increasing Understanding of IS Role and Contribution (Rank #3)

IS is often viewed as an operational activity with little recognition for its strategic contribution to the organization. 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. This issue is closely related to "IS Strategic Planning" (issue #7) whereby the mission and IS charter are often reviewed.

4.1.4 Making Effective Use of the Data Resource (Rank #4)

The organization's data resource is growing in size, complexity, and value. Despite this, it remains largely unrecognized, inaccessible, and underutilized. IS must develop a climate within its department and throughout the organization which values the data resource as a corporate asset. Effective Use of the Data Resource can be achieved if the information architecture (issue #5) can support the integration of information across departmental, functional or geographical boundaries. While information architecture provides the systems and structure to manage information more effectively, managers are often unaware of what data is available, or they do not know how to access the required data in a timely manner and use it effectively to support decision-making. Perhaps, the use of data warehousing and data mining technologies may help managers in making effective use of the data resource. This issue has consistently received high rating by CIOs in Hong Kong as well as in other

countries.

4.1.5 Developing and Implementing an Information Architecture (Rank #5)

An information architecture represents the major information categories within an enterprise and their relationship to business processes. An information architecture is needed to guide and coordinate application systems development, facilitate the integration and sharing of data and provide the common foundation structure for building a coordinated, responsive and long-lasting set of business applications.

4.1.6 Aligning the IS Organization within the Enterprise (Rank #6)

An IS organization's effectiveness in supporting the needs of the enterprise is dependent on its organizational structure (such as centralized versus decentralized) and its organizational location within the enterprise. This issue tied for the lowest standard deviation of the 24 issues (S.D. = 1.83), indicating a relatively high consensus among the respondents and it has consistently received high rating by CIOs in Hong Kong as well as in other countries.

4.1.7 Improving IS Strategic Planning (Rank #7)

With more business dependent on IT as a strategic resource for achieving and sustaining competitive advantage, the importance of "aligning long-range IS plans with strategic business plans" has always been high. However, IS strategic planning is a very difficult task due to rapidly changing business environment, increased involvement and demand of executives, accelerated technology change as well as the lack of familiarity with IS planning methodologies. This issue has consistently received high rating by CIOs in Hong Kong as well as in other countries.

4.1.8 Using Information System for Competitive Advantage (Rank #8)

Some senior executives and IT managers have begun to build creative and innovative systems that can be utilized to create new business opportunities and enable an organization to differentiate itself in the marketplace. This issue has consistently received high rating by CIOs in Hong Kong as well as in other countries. This issue is dependent on the effective use of data (issue #4), the development of appropriate information architecture (issue #5) and its impact in improved IS strategic planning (issue #7).

4.1.9 Facilitating and Managing End-User Computing (Rank #9)

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.

4.1.10 Managing the Existing Portfolio of Legacy Applications (Rank #10)

Most organizations have a large investment in their existing applications portfolio. Some "legacy" applications may need to be retired quickly if the cannot be maintained or the maintenance cost is far too high. Others may need to be leveraged for many years before they are replaced. Integrating new technologies and migrating to new operating environments can be difficult. The Y2K issue has raised the importance of converting the legacy applications to

become Y2K compliant. Some legacy applications cannot become Y2K compliant and they will have to be replaced with new systems/packages, reducing/eliminating the need to support some legacy applications in the next millennium.

Other Issues. The four issues in Table 7 have the highest standard deviation, indicating a low level of agreement among the respondents in the 1999 study. With the exception of issue #20, the other three issues jumped in average rating and ranking in its perceived importance in 2004 as described in the next section.

Table 7. IS Management Issues in H.K.: Least Important Issues with Low Agreement among CIOs

Critical Issues of IS Management (1999)	Mean	S.D.	Classification
20. Developing and Managing Distributed Systems	5.93	2.49	TI
21. Facilitating/Managing Decision and Executive Support Systems	5.88	2.49	TA
22. Developing and Managing Electronic Data Interchange (EDI)	5.64	2.88	TI
23. Outsourcing Selected Information Services	5.36	2.50	IE

4.2. Future Issues

Table 8. Critical Issues of IS Management in H.K. – Comparison between 1999 and 2004

Critical Issues of IS Management in Hong Kong	Mean			Rank			Class
	1999	2004	Change	1999	2004	Change	
Using Information System for Competitive Advantage	7.00	8.00	**1.00**	8	**1**	7	BR
Building a Responsive IT Infrastructure	7.43	7.84	0.41	2	2.5	-0.5	TI
Making Effective Use of the Data Resource	7.18	7.84	0.66	4	2.5	1.5	BR
Improving IS Strategic Planning	7.04	7.76	0.72	7	4	3	BR
Improving the Effectiveness of Software Development	7.57	7.60	0.03	1	5	-4	IE
Improving Information Security and Control	6.80	7.52	0.72	13	5	**8**	IE
Developing & Implementing an Information Architecture	7.11	7.48	0.37	5.5	7	-1.5	TI
Aligning the IS Organization within the Enterprise	7.11	7.44	0.33	5.5	8.5	-3	BR
Planning and Managing Communication Networks	6.82	7.44	0.62	11.5	8.5	3	TI
Measuring IS Effectiveness and Productivity	6.82	7.36	0.54	11.5	10	1.5	IE
Facilitating/Managing Decision and Executive Support Systems	5.88	7.20	**1.32**	21	11	**10**	TA
Increasing Understanding of IS Role and Contribution	7.29	7.08	*-0.21*	3	13	*-10*	BR
Establishing Effective Disaster Recovery Capabilities	6.40	7.08	0.68	16	13	3	IE
Outsourcing Selected Information Services	5.36	7.08	**1.72**	23	13	**10**	IE
Implementing and Managing Collaborative Support System	6.25	7.04	0.79	18	15	3	TA
Facilitating and Managing End-User Computing	6.96	7.00	0.04	9	16	*-7*	TA
Developing and Managing Electronic Data Interchange (EDI)	5.64	6.96	**1.32**	22	17	5	TI
Facilitating and Managing Business Process Redesign	6.75	6.84	0.09	14	18	-4	BR
Facilitating Organization Learning	6.32	6.60	0.28	17	19	-2	BR
Recruiting and Developing IS Human Resources	6.57	6.44	*-0.13*	15	20	-5	IE
Planning & Integrating Multi-Vendor Open System Technologies	6.07	6.24	0.17	19	21.5	+2.5	TI
Developing and Managing Distributed Systems	5.93	6.24	0.31	20	21.5	-1.5	TI
Managing the Existing Portfolio of Legacy Applications	6.89	5.88	*-1.01*	10	23	*-13*	IE
Planning and Using CASE Technology	4.80	5.20	0.40	24	24	0	TA
Overall Mean:	6.58	7.05	0.47				

Classification: BR = Business Relationship   IE = Internal Effectiveness
                 TA = Technology Application   TI = Technology Infrastructure

The 24 issues in Table 8 have been listed in descending order from most important to least important based on the average rating by the respondents for 2004. In general, CIOs gave higher average rating for issues in 2004 than its counterparts in 1999. The major change of the IS management issues between 2004 and 1999 are compared and discussed below.

4.2.1   More Important Issues in 2004

CIOs gave the following issues much higher average rating for 2004:

Outsourcing Selected Information Services: it scored higher rating (+1.72) and jumped from 23rd in 1999 to 13th in 2004. This issue has received the highest jump both in average rating and ranking. When more outside contractors may be able to provide some services more cost effectively, the internal IS organization is no longer has a monopoly and more organizations are expected to outsource part or all of their IT functions. What services should be outsourced? How should contractor relationships be managed? Fair and objective evaluation techniques are needed for assessing costs and benefits as well as potential risks from loss of control. For example, the Information Technology Services Department of the government of the Hong Kong Special Administration Region has planned to outsource two-thirds of new IT projects from 2000.

Facilitating/Managing Decision and Executive Support Systems: it scored higher rating (+1.32) and jumped from 21st in 1999 to 11th in 2004. 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, these efforts have met with mixed success.

Developing and Managing Electronic Data Interchange (EDI): it scored higher rating (+1.32) and jumped from 22nd in 1999 to 17th in 2004. Electronic communication (via the Internet or proprietary EDI networks) with customers and suppliers may offer competitive advantage to a company or it may be a requirement for staying in business (competitive necessity). IS executives must develop (or adapt to) standard transaction formats, keep current on technology developments, and learn to manage inter-organizational projects. The authors believe that EDI services would be migrated from proprietary EDI networks (e.g. Tradelink) to Internet-based EDI networks, which will facilitate both local and global access at a lower cost in order to attract a critical mass of customers, especially small and medium enterprises (SMEs).

Using Information System for Competitive Advantage: it scored higher rating (+1.00) and jumped from 8th in 1999 to 1st in 2004. In many businesses, long-term survival is dependent on using information systems to gain competitive advantage. Competitive advantage results from recognition of opportunities through creativity and innovation, which will be followed by rapid implementation. These are historical weaknesses of the IS organization.

4.2.2   Less Important Issues in 2004

CIOs gave the following three issues lower average rating for 2004:

Managing the Existing Portfolio of Legacy Applications: it dropped from 10th (6.89) in 1999 to 23rd (5.88) in 2004. The decrease in its importance in this 5-year period is partly due to legacy applications being gradually replaced/outsourced in order to resolve the Y2K problem.

Increasing Understanding of IS Role and Contribution: it dropped from 3rd (7.29) in 1999 to 13th (7.08) in 2004. IS is often viewed as an operational activity with little recognition for its

strategic contribution to the organization. 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.

Recruiting and Developing IS Human Resources (ISHR): it dropped from 10th (6.57) in 1999 to 23rd (6.44) in 2004. Current and future shortage of qualified IS personnel threaten the organization's ability to make effective use of information technology. This issue is closely associated with IS Outsourcing. When more IS services are outsourced, "Recruiting and Developing ISHR" will become less important. Perhaps, the direction for ISHR is to increase emphasis in the evaluation of IT products and services, contract negotiation and service level management.

5. Critical Issues of IS Management – An International Comparison

Since the study adopts a similar structure that is used in several countries, it may be useful to compare and contrast a number of critical issues. Hence, this section provides a cross-comparison of the Hong Kong study in 1999 together with results from three other studies from the US in 1994 by Brancheau et, al. (1996), from Taiwan in 1994 by Yang (1996) and from Australia in 1996 by Pervan (1997). The ranking of these issues among the four studies is shown in Table 6 with the issues listed in descending order from most important to least important based on the ranking of results from the 1999 Hong Kong study.

5.1. Critical Issues of IS Management – Cross-comparison

Among the top 10 issues of the 1999 Hong Kong study listed in Table 9, six are in the top 10 rankings in the US study; six are among Taiwan's top 10 rankings; and five are among Australia's top 10 rankings. The following three issues are among the top 10 rankings in all four studies:
- Improving the Effectiveness of Software Development (IE)
- Making Effective Use of the Data Resource (BR)
- Developing and Implementing an Information Architecture (TI)

"Building a Responsive IT Infrastructure" is ranked as the most critical issue in the US and the second most important issue in Hong Kong and Australia, though it was not included in the Taiwan study. "Using Information System for Competitive Advantage" is ranked as the most critical issue in Taiwan, Australia and Hong Kong (2004).

The following three issues "Recruiting and Developing IS Human Resources", "Facilitating and Managing Business Process Redesign (BPR)" and "Developing and Managing Distributed Systems" were among the top ten issues in the US study but they received much lower ranking by CIOs in Hong Kong. While BPR may be seen as a "fad", we feel that more emphasis needs to be put on "recruiting and developing IS human resources", especially business skills for enhancing IS applications and electronic businesses with object-oriented design, Internet-based and multimedia systems.

Table 9. Critical Issues of IS Management – an International Comparison

Critical Issues of IS Management	Hong Kong				US	Tai-wan	Aust-ralia	Classi-fication
	1990	1994	**1999**	2004	1994	1994	1996	
Improving the Effectiveness of Software Development	6.5	1	**1**	5	**6**	**8**	**7**	IE
Building a Responsive IT Infrastructure	-	16	**2**	2.5	**1**	-	**2**	TI
Increasing Understanding of IS Role and Contribution	-	13	**3**	12	13	11	26	BR
Making Effective Use of the Data Resource	5	2	**4**	2.5	**7**	**5**	**3**	BR
Developing & Implementing an Information Architecture	-	4	**5.5**	7	**4**	**7**	**4**	TI
Aligning the IS Organization within the Enterprise	3	10	**5.5**	8	**9**	**4**	20	BR
Improving IS Strategic Planning	2	3	**7**	4	**10**	**2**	13	BR
Using Information System for Competitive Advantage	6.5	5	**8**	1	17	**1**	**1**	BR
Facilitating and Managing End-User Computing	-	15	**9**	16	16	16	17	TA
Managing the Existing Portfolio of Legacy Applications	-	14	**10**	23	15	-	15	IE
Planning and Managing Communication Networks	-	11	11.5	9	**5**	12	12	TI
Measuring IS Effectiveness and Productivity	-	6	11.5	10	11	13	**4**	TA
Improving Information Security and Control	-	9	13	5	-	**3**	11	TA
Facilitating and Managing Business Process Redesign	-	-	14	18	**2**	-	**9**	BR
Recruiting and Developing IS Human Resources	1	7	15	20	**8**	**9**	27	IE
Establishing Effective Disaster Recovery Capabilities	-	11	16	12	-	-	10	TA
Facilitating Organization Learning	-	8	17	19	14	-	**8**	BR
Implementing & Managing Collaborative Support System	-	-	18	15	11	-	23	IE
Planning & Integrating Multi-Vendor Open System Technologies	8	20	19	22	18	**6**	28	TI
Developing and Managing Distributed Systems	-	18	20	21	**3**	-	20	TI
Facilitating/Managing Decision & Executive Support Systems	-	17	21	11	-	**10**	**4**	IE
Developing & Managing Electronic Data Interchange (EDI)	-	-	22	17	19	15	19	TI
Outsourcing Selected Information Services	-	-	23	12	20	-	25	IE
Planning and Using CASE Technology	-	19	24	24	-	17	31	IE

Classification: BR = Business Relationship   IE = Internal Effectiveness
                      TA = Technology Application   TI = Technology Infrastructure

5.2. Analysis by Classification of the Top 10 Issues

Table 10. Classification of Top 10 Issues of IS Management

Classification of Issues	Number of Issues	Hong Kong			US	Taiwan	Australia
		1994	**1999**	2004	1994	1994	1996
Business Relationship (BR)	7	6	**5**	4	4	4	5
Internal Effectiveness (IE)	7	2	2	3	2	3	0
Technology Application (TA)	4	0	1	0	0	1	3
Technology Infrastructure (TI)	6	2	2	3	4	2	2
Management Issues	12	7	6	5	5	6	6
Technology Issues	12	3	4	5	5	4	4
Planning Issues	4	3	**4**	3	2	2	2
Control Issues	20	7	6	7	8	8	8
Internal Issues	10	5	4	5	4	5	5
External Issues	14	5	6	5	6	5	5

The count of the top 10 critical issues of IS management (out of the 24) are shown in Table 10. In the first classification, CIOs in Hong Kong included 5 out of the 7 Business Relationship (BR) issues in the top 10. The importance of BR issues is echoed by results from USA, Taiwan and Australia. The least important group is Technology Application (TA), which included 1 out of 4 issues. In the Planning or Control group, CIOs in Hong Kong included 4 out of the 4 planning issues on the top 10, which is much higher than the counterparts of the other 3 countries (with 2 out of 4 planning issues). In the Management or

Technology group, management issues were rated higher than technology issues in the top 10. No significant differences can be drawn from the Internal and External issues.

6. Conclusions

This study provides an analysis on the critical issues of IS management in Hong Kong in 1999 and compares with previous studies in Hong Kong, USA, Australia and Taiwan. It should be useful for CIOs and senior executives in the management and control of the IT function, especially in IS strategic planning.

The small number of survey respondents affects the reliability of this study. Hence, it is difficult to use the results to generalize and draw more precise conclusions. A further study with larger samples will be desirable. The Y2K problem has a tremendous impact on the priorities of CIOs and senior executives in choosing important IS management issues, the authors believe that another study in the new Millennium may eliminate this temporal impact. Some CIOs in "other issues" of the questionnaire indicated some important issues that were not included in the research instrument (e.g. electronic commerce and knowledge management) and these issues should be included in the next round of study. While the comparisons of the results from the latest studies in various countries provide some useful cross-references, it would be desirable if a large-scale study could be conducted in the same year in several countries.

CIOs and senior executives in public sector and private sector may have very different priorities on various IS management issues. Hence, more focused studies on the similarities and differences between two groups will be desirable. Also, the role of government (e.g. Information Technology and Broadcasting Bureau, Information Technology Services Department, universities, Vocational Training Council, and Hong Kong Productivity Council, etc.) and professional bodies (e.g. Hong Kong Computer Society, Hong Kong Institute of Engineers, Hong Kong Management Associations, etc.) in addressing these critical issues should also be examined.

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Appendix 1: Survey Research Instrument

Critical Information Systems Management Issues

The following 24 issues have been listed in descending order from most important to least important based on the average rating by the respondents for the current year (1999). Respondents were requested to rate each issue on a scale from 1 to 10, where 10 indicates his/her most important issue(s) and 1 indicates his/her least important issue(s). The original sequence in the survey questionnaire is different from this list.

Less Important			Moderately Important				Most Important		
1	2	3	4	5	6	7	8	9	10

(Please fill in your rating in the spaces provided below.)

1999 | 2004

7.57   7.60   **1. Improving the Effectiveness 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 effectiveness will be essential for next-generation applications.

7.43   7.84   **2. 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.

7.29   7.08   **3. Increasing Understanding of IS Role and Contribution**

IS is often viewed as an operational activity with little recognition for its strategic contribution to the organization. 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.

7.18   7.84   **4. Making Effective Use of the Data Resource**

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

7.11   7.48   **5.5 Developing & 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.

7.11   7.44   **5.5 Aligning the IS Organization within the Enterprise**

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

7.04   7.76   **7. Improving IS Strategic Planning**

It has always been important to align long-rang 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.

1999	2004	
7.00	8.00	**8. Using Information Systems for Competitive Advantage**

In many businesses, 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 organization.

6.96	7.00	**9. 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.

6.89	5.88	**10. Managing the Existing Portfolio of Legacy Applications**

Most organizations 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 to new operating environments can be difficult. Too little is known about managing these problems.

6.82	7.44	**11.5 Planning and Managing Communication Networks**

Communication is the lifeblood of the organization. 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. (e.g. Internet, Intranet, Video Conferencing and Wireless Networks).

6.82	7.36	**11.5 Measuring IS Effectiveness and Productivity**

Understanding how IT use impacts the bottom-line is crucial for justifying new investment. In addition, measuring the IS organization's performance is necessary for effective management. Measurement is becoming more important as companies attempt to reduce operating expenses to meet the competition.

6.8	7.52	**13. Improving Information Security and Control**

As organizations 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.

6.75	6.84	**14. Facilitating and Managing Business Process Redesign**

To remain competitive, many organizations 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.

6.57	6.44	**15. Recruiting and Developing IS Human Resources**

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

6.40	7.08	**16. Establishing Effective Disaster Recovery Capabilities**

Downside 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 minimized. As organizational applications grow and become more integrated, the greater the risk becomes.

6.32   6.60   **17. Facilitating Organizational Learning**

Organizations that prosper will need to make appropriate use of information technologies across their entire enterprise. Business practices and organizational structures will need to be modified in many cases. IS also must demonstrate its own ability to learn and use new technology.

6.25   7.04   **18. Implementing and Managing Collaborative Support System**

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

6.07   6.24   **19. Planning and Integrating Multi-Vendor Open System Technologies**

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

5.93   6.24   **20. Developing and Managing Distributed Systems**

Client-server applications promise to offer a cost-effective alternative to centralized application. 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.

5.88   7.20   **21. Facilitating/Managing Decision and Executive 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, these efforts have met with mixed success.

5.64   6.96   **22. Developing and Managing Electronic Data Interchange (EDI)**

Electronic communication (via internet or proprietary EDI networks) 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-organizational projects.

5.36   7.08   **23. Outsourcing Selected Information Services**

The internal information systems organization 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.

4.80   5.20   **24. Planning and Using CASE Technology**

Significant progress has been made automating business functions within organization; 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, standardizing representation methods, and 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.