

# **Management Issues in the Development of Information Systems: A Hong Kong study**

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## *Abstract*

The results of a survey are presented which investigated the relative importance of 20 IS issues currently (1994) and over the next five years (1995-1999). The survey was based on previous studies carried out in the USA and Taiwan (ROC). The only major issues which changed in Hong Kong were a decline in the importance of recruiting and maintaining a skilled workforce (*IS human resources*), accompanied by an increase in the importance of the need for a good communication network (*Telecommunications*). Comparing the results with those of the USA and Taiwan revealed seven issues common across all three studies. In particular, the ability to anticipate and adapt to the changing face of IS (*IS strategic planning*) was a top three issue for the USA, Taiwan and Hong Kong. Explaining the significance and meaning of the differences, however, remains an area of further research.

## **1. INTRODUCTION**

This paper presents the results of a survey which investigated the key IS issues facing organisations in Hong Kong. Following the example of similar studies carried out in the USA (Dickson *et al.*, 1984; Brancheau & Wetherbe, 1987; Niederman *et al.*, 1991) and Taiwan (ROC)(Wang, 1994), a questionnaire was constructed where a list of 20 IS issues are ranked in terms of relative importance now and in the next five years. Since IS is still developing in Hong Kong and there are different political, economic, and cultural factors to be taken into account, the results of the survey are likely to differ from the studies mentioned above. The next section describes the structure of the questionnaire and the sampling method used. The results of the survey are then presented in terms of current and future issues. The discussion will focus on the Top 10 current and future issues on the basis that these define the set of critical IS issues. Conclusions based on comparisons between this study and those carried out in the USA and Taiwan are drawn and identify areas of further research.

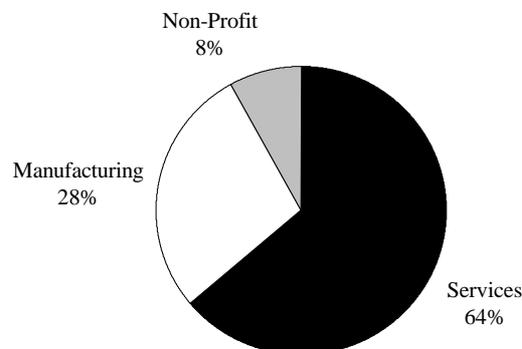
## **2. THE SURVEY**

This study investigates the ranking of IS issues currently (1994) and over the next five years (1995-1999) in Hong Kong, based on the questionnaire developed by Niederman *et al.* (1991). In their study, Niederman *et al.* (1991) used a three-round Delphi method. The objective of the Delphi method is to discuss drafts of a list of IS issues in order to surface new issues and move participants toward consensus (Delbecq *et al.*, 1975). Starting with a base-line questionnaire, succeeding questionnaires summarize group responses to the preceding questionnaire and ask participants to re-evaluate their opinions based on the new evidence. The Delphi process stops when a reasonable level of consensus is achieved. Given the interest in comparing the different surveys, the Hong Kong survey made use of the final list of 20 IS issues as developed by Niederman *et al.* (1991).

Participants - who are described later - were requested to rate the most critical issues facing Hong Kong IS executives currently (1994) and over the next five years (1995-1999) on a 10-point scale. A score of 10 indicated their highest priority issue(s) and 1 indicated their lowest. Such a rating method avoids the problems of having to consider simultaneously all 20 issues in order to rank them, and provides useful interval-level data for further analysis. The 20 issues were ranked according to their mean score. The standard deviation was also calculated as a measure of the spread of opinion. In order to clarify the 20 issues, each issue is briefly described in Appendix 1.

In early January 1994, three hundred questionnaires were mailed to MIS managers in different organizations, with names and addresses randomly selected from "Asian Computing Directory 1992" (ACD, 1992). Usable responses were received from 108 respondents, yielding a response rate of 36%. A profile of survey respondents by industry in Hong Kong is provided in Figure 1. In terms of industry representation, the majority of respondents came from commercial sectors of services (64%) and manufacturing (28%), with a minority from the non-profit sector (8%). The dominance of services is useful for this study because the services industries such as banking rely heavily on computerized information systems and so should give pertinent information to this study.

**Figure 1** Respondents by industry



### 3. CURRENT ISSUES

After calculating the mean score for each issue in terms of their current importance (for 1994) and their importance over the next five years (1995 - 1999), the 20 issues were then ranked (See Table 1). Each of the currently rated Top 10 issues are discussed briefly below.

#### **Rank 1 - *Quality of software development***

While the demand for IS is increasing, the backlog of systems yet-to-be-built remains high (Boehm & Papaccio, 1988). This creates a tension between developing the systems which meet a need but have been postponed, and maintaining a high degree of quality in the development process. Quality often demands time in order to properly assess the system, from code inspections to user testing. This issue summarises a number of problems in the development of IS. How can it be done well? How can we get it right first time, more of the time, and hence maintain our productivity? Rating this issue first suggests that IS in Hong Kong has reached a stage where it is no longer an issue of whether to invest in IS (note that *IS role and contribution* was ranked 13th in importance), but how it can be provided efficiently and cost-effectively.

**Table 1** Hong Kong rankings of current IS issues

	<b>Issue, 1994</b>	<b>Mean</b>	<b>St.Dev</b>
			.
<b>1</b>	<b>Quality of software development</b>	<b>7.25</b>	<b>1.91</b>
<b>2</b>	<b>Use of data resources</b>	<b>7.14</b>	<b>1.86</b>
<b>3</b>	<b>IS strategic planning</b>	<b>6.94</b>	<b>1.91</b>
<b>4</b>	<b>Developing an information architecture</b>	<b>6.81</b>	<b>2.12</b>
<b>5</b>	<b>IS for competitive advantage</b>	<b>6.75</b>	<b>2.36</b>
<b>6</b>	<b>Measuring IS effectiveness/productivity</b>	<b>6.56</b>	<b>1.99</b>
<b>7</b>	<b>IS human resources</b>	<b>6.33</b>	<b>2.49</b>
<b>8</b>	<b>Orgainsational learning of IS</b>	<b>6.25</b>	<b>1.71</b>
<b>8</b>	<b>Security and control</b>	<b>6.25</b>	<b>2.38</b>
<b>10</b>	<b>Aligning IS with the enterprise</b>	<b>6.19</b>	<b>2.18</b>
11	Telecommunications	6.14	2.25
12	Disaster recovery	6.13	2.57
13	IS role and contribution	6.06	1.67
14	Applications portfolio	6.03	1.76
15	End-user computing	5.94	1.93
16	Developing an IT infrastructure	5.81	2.60
17	DSS/EIS	5.67	2.35
18	Distributed systems	5.65	2.27
19	CASE	5.36	2.39
20	Multi-vendor integration	4.97	2.27

**Rank 2 - Use of data resources**

As organisations become more sophisticated in their use of IT, there is the potential to collect data at many points in the business. Making effective use of this corporate asset is the role of the IS executive who must foster a climate within which this data is recognised, valued, made accessible and utilised(Frenzel, 1991). This appears to be a particularly important issue in Hong Kong where tertiary industries, such as banking, securities, etc., are dominant. For these industries IS underpins their business in its ability to support the recording of customers, their accounts, the vast number of personal transactions that are carried out, and the provision of timely information on the exact state of these accounts. With such large volumes of data being processed, however, there is also the problem of how to combine this information in order to support decision-making without suffering from information overload. This remains the challenge of effective IS.

### **Rank 3 - IS strategic planning**

With more business dependent on information technology as both a sustaining force and competitive weapon, IS strategic planning requires close alignment with business plans. As the technology underpinning IS continues to change at an accelerating rate, there is a need to improve strategic planning skills to anticipate and adapt to these changes (Certo & Peter, 1988). Such planning must be done in the face of the uncertainty of technological changes within IS, and constraints such as the alignment of the IS department within the enterprise (ranked 10th). Given the rate at which IS is changing, effective strategic planning remains a serious problem.

### **Rank 4 - Developing an information architecture**

An information architecture represents the information categories contained within an organisation and their relationship to business processes. For instance, a manufacturing process may be defined in terms of categories of "Goods received", "Units in production" and "Units in stock". An information architecture is required to guide applications development and facilitate the integration and sharing of data and provides the basis for building a coordinated, responsive, long-lasting set of business applications (Brancheau *et al.*, 1989). However, the breadth of information requirements and the rapid changes within the business environment make the capture and maintenance of such an architecture extremely difficult.

### **Rank 5 - IS for competitive advantage**

Competitive advantage results from the recognition of opportunities through creativity and innovation, followed by rapid implementation (Brancheau & Wetherbe, 1987). Clearly, IS can help in organising the information from which a niche can be identified, but the exploitation of this new opportunity is likely to depend on other factors, such as organisational flexibility and responsiveness (ranked 8th), and

being able to effectively integrate business activities (Stalk, 1988). Effective integration is further dependent on a number of other issues, such as the effective use of data, improved strategic IS planning and the development of an information architecture (ranked 2nd, 3rd and 4th, respectively). Using IS for competitive advantage, therefore, encompasses a number of difficulties.

#### **Rank 6 - *Measuring IS effectiveness/productivity***

Measuring IS productivity and the impact the system has on the effectiveness of the business is crucial to understanding the costs and benefits of IS. Without such measures the value of IS cannot be properly understood. As companies invest more money in IS, the need to measure its cost and impact becomes correspondingly important. However, it is not always possible to untangle the contribution IS has on an organisation from other motivational forces, such as job satisfaction. Although such measures must be defined in order to justify IS expenditure, how to adequately capture their full benefits or costs remains a challenge.

#### **Rank 7 - *IS human resources***

The perceived shortage of well-qualified IS professionals threatens the effective use of IS. Furthermore, it is far from clear exactly which skills best define a "good" IS professional, how they may be recruited, and how best they should be trained within the organisation (Cougar, 1988). According to a recent report in Hong Kong, the vacancy and turnover rates in the field of electronic data processing are as high as 7.1% and 20.2%, respectively (VTC, 1989). Recruiting personnel with inadequate skills results in low productivity and low quality of systems.

#### **Rank 8(1) - *Organizational learning of IS***

If an organisation is to make maximum use of currently available technology, it must be able to demonstrate an ability to absorb new tools and adapt to more

effective ways of doing business. The IS department must also demonstrate its own ability to learn and use new technology (Bouldin, 1989). Making appropriate use of new IS technologies remains a critical factor of a company's success.

### **Rank 8(2) - Security and Control**

The collection, storage and retrieval of data to provide pertinent information about the business remains the key function of IS. However, since all the necessary facts are available from one source (the information system), it is also important to control who has access in order to avoid unauthorised disclosure, destruction or alteration of the data. Tight security controls and fault-tolerant information delivery become significant issues for all IS executives, and especially for the Hong Kong sample where 64% are from the services industry (see again Figure 1).

### **Rank 10 - Aligning IS with the enterprise**

If the organisation has a strongly decentralised structure, then IS needs to become localised, and the IS department must be sensitive and respond to such a structure. The opposite case is also true, where a strongly decentralised IS department would become ineffective in a strongly centralised organisation. Too often IS is not properly aligned with the organizational structure (Dixon & John, 1989), leading to the development of systems which do not faithfully reflect the way in which the organisation does business.

## **4. FUTURE ISSUES**

The ratings of the 20 IS issues in terms of importance over the next five years (1995-1999) is given in Table 2. As can be seen, the mean scores for each issue are higher than their corresponding mean scores as a current issue. This can be interpreted in one of two ways: either, IS is perceived as being more important in the future business environment in Hong Kong; or, future problems always seem more critical than current issues. Nine of the Top 10 issues in Table 1 remain in the Top

10 in Table 2, while all the current Top 5 issues are seen as being important in the future. This suggests that the critical issues facing IS executives in the future are not perceived to be substantially different from those which are currently seen as important.

**Table 2** Hong Kong rankings of future IS issues

	Issue, 1995-1999	Mean	St.Dev	Change from 1994
1	<b>Use of data resources</b>	<b>7.89</b>	<b>1.75</b>	+1
2	<b>Quality of software development</b>	<b>7.61</b>	<b>1.96</b>	-1
3	<b>IS for competitive advantage</b>	<b>7.50</b>	<b>2.37</b>	+2
4	<b>Developing an information architecture</b>	<b>7.44</b>	<b>1.57</b>	0
5	<b>IS strategic planning</b>	<b>7.42</b>	<b>1.95</b>	-2
6	<b>Security and control</b>	<b>7.11</b>	<b>2.28</b>	+2
7	<b>Telecommunications</b>	<b>7.08</b>	<b>2.31</b>	+4
8	<b>Organisational learning of IS</b>	<b>7.06</b>	<b>1.75</b>	0
9	<b>Aligning IS with the enterprise</b>	<b>6.97</b>	<b>2.29</b>	+1
10	<b>Measuring IS effectiveness/productivity</b>	<b>6.86</b>	<b>1.81</b>	-4
11	End-user computing	6.83	1.81	+4
11	Disaster recovery	6.83	2.37	+1
13	DSS/EIS	6.81	2.26	+4
14	Distributed systems	6.72	2.09	+4
14	Developing an IT infrastructure	6.72	2.27	+2
16	Multi-vendor integration	6.56	2.41	+4
17	Applications portfolio	6.39	1.55	-3
17	IS human resources	6.39	2.64	-10
19	IS role and contribution	6.36	1.81	-6
20	CASE	5.97	2.60	-1

Table 2 also expresses the difference in rank of each issue between current and future. A positive difference indicates that the issues was rated as being more important (attaining a higher rank) in the future than currently. A negative difference indicates the opposite. For example, the issue of *Use of the data resources* was ranked 2nd as a current issue, but ranked 1st as a future issue. Thus, the difference is +1. Only one issue (*IS human resources*) can be seen to have dropped out of the Top 10 issues in the future, being replaced by *Telecommunications*, which was previously ranked 11th as a current issue. These two issues will be discussed briefly below.

#### **4.1 IS Human Resources**

This issue had the greatest difference of ranking (-10) between current and future. It is ranked 7th currently but only 17th as a future issue. Such a drop in importance suggests it is perceived as being on the verge of being solved. This is possibly due to the increase of graduates from computing courses in Hong Kong's tertiary education sector. For instance, in the City Polytechnic of Hong Kong alone, the number of students for the BA(Hons) Information Systems degree course is expected to increase by over 30% in the next three years from 1994. With these figures increasing year-on-year across the Hong Kong institutions, the outlook would seem to be brighter for the recruitment of IS-educated professionals by IS departments.

#### **4.2 Telecommunications**

Data is only useful if it can be communicated to the right place and person (Clemons and McFarlan, 1986). In this sense, an effective telecommunications system may be the key to further advances in Management Information Systems (MIS). Communication is often the catalyst for achieving other important targets. For instance, using *IS for competitive advantage* (ranked 3rd as a future issue) often depends heavily on telecommunications. The importance for Hong Kong is likely to centre on the territory's attempt to rapidly develop its business and manufacturing towards the market in China. Given the vast distances across China, a sophisticated telecommunications system will play a critical role in any business transactions. This is likely to be equally true for all countries seeking a share of the China markets. However, with advances in optic-fibre and EDI technology, the telecommunications industry is changing at a pace equal to anything in IS.

**Table 3** Comparison of Top 10 ranking in the USA (Niederman et al., 1991), with current issues in Hong Kong

	<b>IS issue</b>	<b>USA</b>	<b>HK Dif.</b>
1	Developing an information architecture	1	+3
2	Use of data resources	2	0
3	Is strategic planning	3	0
4	IS human resources	4	+3
5	Organisational learning of IS	5	+3
6	Developing an IT infrastructure	6	+10
7	Aligning IS with the enterprise	7	+3
8	IS for competitive advantage	8	-3
9	Quality of software development	9	-8
10	Telecommunications	10	+1

**Table 4** Comparison of Top 10 ranking in Taiwan (ROC)(Wang, 1994), with current issues in Hong Kong

	<b>IS issue</b>	<b>Taiwan</b>	<b>HK Dif.</b>
1	IS strategic planning	1	+2
2	IS for competitive advantage	2	+3
3	Developing an IT infrastructure	3	+13
4	Security and control	4	+4
5	Quality of software development	5	-4
6	Use of data resources	6	-4
7	Organisational learning of IS	7	+1
8	IS role and contribution	8	+5
9	IS human resources	9	-2
10	Developing an information architecture	10	-6

## 5. COMPARISON BETWEEN HONG KONG, THE USA AND TAIWAN

Since the structure of this study parallels a number of other studies, it may be useful to speculate on the presence of a number of IS issues common across countries. To this effect, the Top 10 issues from the USA in 1989 (Niederman *et al.*, 1991) and the Top 10 issues from Taiwan in 1992 (Wang, 1994) compared to current issues in Hong Kong in 1993 (from Table 1) are given in Tables 3 and 4, respectively. Although Wang (1994) uses a list of 30 IS issues, the list is partially based on the Niederman *et al.* study, and so direct comparisons can be made by stripping the list down to the required 20 and re-calculating the ranks.

The difference in the position between the ranking of the issue in the USA or Taiwan with respect to Hong Kong is also given in these Tables. For instance, *Developing an information architecture* was rated 1st in the USA and 4th in Hong Kong, so the difference with respect to Hong Kong is +3. As can be seen, the Top 10 for the USA, Taiwan and Hong Kong are more or less the same with seven issues in common across all three studies, as follows:

- *Developing an information architecture*
- *Use of data resources*
- *IS strategic planning*
- *IS human resources*
- *Organisational learning of IS*
- *IS for competitive advantage*
- *Quality of software development*

Even though *IS human resources* is rated as a relatively unimportant issue over the next 5 years in Hong Kong, the similarity between the current issues of these three studies suggest that the above is close to a list of the most critical issues facing all IS executives.

Further research would have to be carried out, however, in order to understand the meaning and significance of differences between the various Top 10s. Each country differs by two issues from each other country (see Table 5). Most notably for IS executives in Hong Kong, *Developing an IT infrastructure* is ranked 6th in the USA and 3rd in Taiwan, but is absent from the Top 10 in Hong Kong (ranked 16th). Conversely, *Measuring IS effectiveness/productivity* is ranked 6th in Hong Kong, but is absent from the Top 10 of the USA or Taiwan (ranked 16th and 12th, respectively). Furthermore, *Security and control* is ranked 8th in Hong Kong and 4th in Taiwan, but is absent from the Top 10 of the USA. Although the issue *Aligning IS with the enterprise* is a top issue in the USA and Hong Kong (7th and 10th, respectively), it has a similar importance in Taiwan (ranked 11th).

**Table 5** Differences in Top 10 issues between Hong Kong, the USA and Taiwan

<b>Top 10 Hong Kong, but not Top 10 USA</b>	In HK	In USA
1. <i>Measuring IS effectiveness/productivity</i>	6th	16th
2. <i>Security and control</i>	8th	19th
<b>Top 10 Hong Kong, but not Top 10 Taiwan</b>	In HK	In Taiwan
1. <i>Measuring IS effectiveness/productivity</i>	6th	12th
2. <i>Aligning IS with the enterprise</i>	10th	11th
<b>Top 10 USA, but not Top 10 Hong Kong</b>	In USA	In HK
1. <i>Developing an IT infrastructure</i>	6th	16th
2. <i>Telecommunications</i>	10th	11th
<b>Top 10 Taiwan, but not Top 10 Hong Kong</b>	In Taiwan	In HK
1. <i>Developing an IT infrastructure</i>	3rd	16th
2. <i>IS role and contribution</i>	8th	13th
<b>Top 10 USA, but not Top 10 Taiwan</b>	In USA	In Taiwan
1. <i>Aligning IS with the enterprise</i>	7th	11th
2. <i>Telecommunications</i>	10th	16th
<b>Top 10 Taiwan, but not Top 10 USA</b>	In Taiwan	In USA
1. <i>Security and control</i>	4th	19th
2. <i>IS role and contribution</i>	8th	11th

But can any meaning be attached to these differences? Does this result give any insight to the state of the IS industry in these different countries? Without extensive research it would be difficult to give any definite answers to the above questions, since a number of overlapping factors are likely to be involved, such as the obvious economic, political and cultural differences. One could speculate, however, that *Security and control* is a relative non-issue in the USA because they have experience of how to deal satisfactorily with the problem, while the issue is new and remains a challenge in Hong Kong and Taiwan. Furthermore, the IS industry in Hong Kong remains small-scale, with the economy dominated by the banking and retail service industries. Again, whether this is significant needs to be investigated.

## **6. CONCLUSIONS AND SUGGESTIONS FOR FURTHER RESEARCH**

This paper has sought to identify the top issues facing IS executives in Hong Kong using a questionnaire based on previous studies. Focusing on the Top 10, it was found that those issues which are seen as important currently (1994) also maintain a high priority in the future (1995-1999) although their specific ranking tended to change. Only one factor dropped out of the Top 10, namely: *IS human resources*, ranked 7th currently, and 17th as a future issue. The suggestion is that increasing numbers of technically trained graduates are seen as fulfilling the perceived needs of the IS industry. On the other hand, *Telecommunications* rose from 11th currently to 7th as a future issue. This suggests research in this area will address an upcoming issue for IS.

Finally, there is no clear means of deciding what the difference in rankings must be before it can be assumed there is clearly a difference in priorities between countries. Would a difference of  $\pm 5$  do? Or must it be  $\pm 10$ ? While understanding how the IS field is changing remains an active area of research (e.g., Friedman, 1994), it is surely the changing perceptions of IS executives which provides the data upon which the relevant analysis can be carried out: IS executives define rather than follow this field. As well as recording these changing perceptions, however, there is a need to interpret them. How this analysis should be carried out remains an open question and remains the aim of further research in this area.

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## 8. APPENDIX

### Appendix 1: A brief description of the 20 IS issues

<b>IS Issue</b>	<b>Description</b>
<b>1</b> Developing an information architecture	Defining the organisation in terms of categories of information and their relationship to business processes.
<b>2</b> IS strategic planning	The strategic planning skills required to anticipate and adapt to changes in Information Technology (IT).
<b>3</b> Use of data resources	Viewing data as a corporate asset and utilising it effectively.
<b>4</b> IS human resources	Specifying, recruiting and developing an IS workforce capable of implementing the required IS strategy.
<b>5</b> IS for competitive advantage	Using IS to support the identification and exploitation of new market niches.
<b>6</b> Aligning IS with the enterprise	Positioning the IS department - geographically and organisationally - so that it fits the centralised or decentralised nature of the enterprise as a whole.
<b>7</b> Organisational learning of IS	Introducing flexibility into the organisation so that it can adapt to new technology quickly and efficiently.
<b>8</b> IS role and contribution	Making clear the benefits and limitations of IS.
<b>9</b> Telecommunications	Planning and implementing a telecommunication system in order to link individuals together.
<b>10</b> Quality of software development	Controlling the software development process so that the quality of delivered systems can be assured.
<b>11</b> Multi-vendor integration	Moving towards open systems to allow for the integration of systems developed by different vendors.
<b>12</b> Applications portfolio	Maintaining and replacing existing systems.
<b>13</b> Measuring IS effectiveness/productivity	Defining the productivity of the IS department and valuing their impact on the organisation.
<b>14</b> Security and control	Protecting data from disclosure, alteration or destruction without authorisation.
<b>15</b> End-user computing	Developing systems which directly support individual, group or departmental needs rather than enterprise-wide systems.
<b>16</b> Distributed systems	Connecting enterprise-wide IS using a network.
<b>17</b> CASE	Automating the IS development process using Computer Assisted Software Engineering (CASE) technology.
<b>18</b> Developing an IT infrastructure	Building an integrated technology platform which maintains a responsive outlook to new technology.
<b>19</b> DSS/EIS	Facilitating and managing the development of Decision Support and Executive Information Systems.
<b>20</b> Disaster recovery	Establishing effective disaster recovery capabilities with recovery plans which are tested at regular intervals.