

Issues of international information systems management: a perspective of affiliates

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Abstract

As business competition becomes global, international information systems (IIS) management presents a significant challenge to multinational corporations and their affiliates. However, very few empirical studies have been conducted to investigate the management of IIS and the issues that confront the IS executives of such corporations. In this study, we perform a three-round Delphi study to identify, rank and evaluate the twenty most significant IIS issues of affiliates. The ratings of these issues suggest that technology infrastructure concerns, rather than planning and management concerns, have a larger impact on the IS operations of foreign affiliates. This study also reports on statistical analyses to differentiate the impact of different industries, respondents, IS structures and international involvement of affiliates on IIS issues ratings. The results indicate that respondents of IS and non-IS executives and affiliates of different international involvement levels have different views on the ratings of IIS issues. Our study also confirms that IIS issues can significantly impact the strategic, tactical and operational IS decisions of affiliates. These findings allow some important implications to be drawn for both practitioners and researchers dealing with IIS issues. © 2001 Elsevier Science B.V. All rights reserved.

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1. Introduction

With the increasing globalization of businesses, multinational corporations (MNCs) are no longer able to compete as a collection of nationally independent subsidiaries [15]. They need to link or integrate their subsidiary activities across geographical locations. Information technology is inevitably the logical choice for achieving such integration objectives. However, building an efficient international information systems (IIS) to support information exchange and

parent-affiliate linkage involves the resolution of many technical and managerial IS issues, stemming from both the parent MNC and its foreign affiliates [7,8]. Although, research efforts have already been undertaken to explore these issues, most were biased towards the parent MNC's perspective. The unique position of subsidiaries which are operating in differing cultural values, political systems and government-business interaction patterns, seems to have been overlooked. The result of such negligence may sometimes be inappropriate formulation of IS strategies to support IS operations overseas. To rectify such problems, the affiliate's unique position should be considered so that appropriate solutions could be designed to deal with their unique IS needs.

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In the MIS discipline, not much empirical work has been devoted to investigating the IIS problems associated with the transfer and management of IS technology. The two studies that are closest to this part of our research, by Deans et al. [5] and Steinbart and Nath [19], explored the international IS issues in US-based MNCs and international networks management issues in American corporations, respectively. However, both of these studies dealt with the issues from a parent MNC's perspective. In our study, we focus on the exploration of the IIS issues significant to the implementation of an effective IIS architecture and strategy strictly from a foreign affiliate's perspective. To be specific, this research is interested in seeking answers to the following questions.

1. What are the important issues that restrict the planning, operation, management and implementation of IIS?
2. What are the relative importance of these IIS issues?
3. Do IS and non-IS executives have the same evaluation of these IIS issues?
4. Do these IIS issues have the same impact on different industry sectors?
5. Will the ratings of IIS issues differ with the affiliate's level of international involvement?
6. Do IIS issues have any impact on the affiliate's strategic, tactical and operational IS decisions?

2. Background

One of the earliest issues studies was performed by surveying the members of the Society for Management Information Systems (SMIS) in 1982 [2]. Since then, four studies [3,4] were performed on SMIS, they attempted to build a cumulative research tradition of IS issues in the US. Due to the significance of this research topic, similar studies have been conducted in other countries (such as [6,22–25]) to explore country-specific IS issues. Unfortunately, the design, sample and approach of these studies varied, making direct results comparison impossible.

Most of the prior studies were evaluated from a domestic perspective. Only a few were approached from a national or international perspective. Selig's study [18], although focused primarily on IS planning

and strategy, highlighted the differences of IS management in the domestic and international environments. He stated that international IT management is extraordinarily complex because of the complication caused by multiple languages, cultures, business philosophies, governments and regulations. Applegate et al. [1] have also confirmed that IIS development and management are highly uncertain and must be managed actively to avert major long-term difficulties within and between national IT activities. They provide a comprehensive list of important multinational IS issues and specify that these issues can emerge from the IS environment, the corporation and the countries in which the business operates. They believe that the success of international IS management requires a long-term view of the corporation since the assimilation of IT in the affiliate's country may be influenced by local conditions rather than the technology itself.

Deans et al. [5] attempted to identify and prioritize important IIS issues in US-based MNCs and they concluded that the top-rated IIS concerns are a mixture of managerial and technical issues similar to the reported domestic issues. They also concluded that multinational firm types and their level of international involvement could have different impacts on the ranking of the IIS issues. Along the same line of research, Steinbart and Nath [19] have attempted to identify the problems and issues in international data communications, again from a MNC's perspective. Their empirical study suggested that the major issues with the global network were mostly technical in nature, including the quality of network services and network management support. They found that both management policies and firm characteristics also affect the successful operation of a global network in the IIS context.

Previous perspectives only represented the MNCs whose operations were headquartered in the US. Saraswat and Gorgone [17] attempted to look wider by conducting a similar study from the perspective of less developed countries. They performed a content analysis of 132 published articles, originating from 25 countries, to identify and rank the major IIS issues that represent the situation in less developed countries. Their study concluded that there are 23 issues that require intensive attention. Some of these issues include IT aid, employment creation with IT, indigenous IT, regional IT cooperation, cost of IT and training

of IT. Unsurprisingly, this list is very different from those generated from the MNCs, as different research methods and designs were used.

3. Research methodology

A three-round Delphi study was conducted to prioritize the importance of IIS issues confronting foreign affiliates operating in Hong Kong. Prior to this Delphi study, a questionnaire about initial IIS issues was derived from earlier studies but undertaken with two important considerations based on the guidelines of Malhotra et al. [11]. First, all the chosen issues were required to be comparable with each other: the level of aggregation, management level of decisions and time frame of decision for each issue had to be similar so

that relative comparisons of importance was meaningful. Second, the initial list of issues also needed to correspond to academic topics.

To ensure the validity of the initial list and questionnaire, two MIS Directors and one VP of Information Resources who were all experienced in IIS management and operations, were interviewed to determine their views on the design and validity of the initial letter, instructions and questionnaires. Based on their input, some questions and instructions were reworded to make them easier to understand. Also, two issues were added and one removed as a result of this pilot testing process. The final list is given in Table 1.

A two-phase approach was adopted to select the panelists for this study. The first involved the identi-

Table 1
The final IIS issue list

Issue nos.	Issues	Explanation
1	Aligning IS organization	The effectiveness of IS in supporting the affiliate's international information needs may be affected by the IS's organizational location within the MNC
2	Managing communication networks	International networks are heavily used to effectively and efficiently transmit information between the affiliate and other sites of the MNC. However, this task is complicated by rapid advances in underlying technology, different regulatory strategies of PTTs, different level of network sophistication, different price and quality of telecommunication, and telecommunication deregulation
3	Building a responsive IT infrastructure	The affiliate needs to build a responsive IT infrastructure to enhance its IS productivity. Unfortunately, the task is frustrated by the rapid changes in infrastructure technology and the increasing breadth and depth of IS applications of the affiliates and the MNCs
4	Managing centralized, decentralized or distributed processing systems	Different processing approaches have been implemented in different foreign affiliates to support international information processing needs. However, MNCs and their affiliates may consider balancing the advantages and disadvantages of centralized, decentralized and distributed approaches to take into account different country variables and restrictions
5	Facilitating and managing business process redesign	The affiliates need to perform IT-enabled business process reengineering to enable the innovative redesign of core international business processes in local sites. This task is complicated by the need to co-ordinate and comply with the IS strategy implemented by the headquarters
6	Dealing with currency restrictions and exchange-rate volatility	International IS processing in the foreign affiliates may become unjustifiable and non-competitive due to currency fluctuation. The financial decisions of the affiliate's IS which include budgeting, staffing, technology investment and processing, will all be influenced by the fluctuation of currency
7	Controlling and making effective data utilization	Data resources of foreign affiliates are valuable to MNCs. Hence, it is necessary to control these resources to allow effective utilization in a timely manner. In the international context, the affiliates may need to consider factors such as different time zones, holidays and working hours
8	Managing IS human resources	Different foreign affiliates may face different IS problems (such as personnel shortage, training etc.) in different countries. This problem may threaten the affiliate's ability to make effective use of their IT which may consequently lower their IS productivity
9	Facilitating and managing end-user computing	End-user computing offers the promise of improved productivity but it may also cause a danger of management control. This control problem will be more acute in the international environment when more complex IS tasks are performed

Table 1 (Continued)

Issue nos.	Issues	Explanation
10	Managing international integration of technologies	Integration of different ITs has been a major IS issue for organizations. This integration process is much more complex in the heterogeneous international processing environment when so many incompatible technologies and platforms need to be logically and physically integrated
11	Planning and managing international MIS	The affiliate's MIS planning which includes integrating IS plans with overall business plans is difficult due to rapidly changing technology, especially in the context of complex multinational information systems. Sometimes, affiliates have to reconcile IS differences and priorities of local versus headquarters IS plans
12	Learning to conduct IS business in other countries	Managing and operating IS processing sites may differ between the headquarters and the affiliate's country. Therefore, the affiliates and MNCs may need to be aware of the potential difficulties that can be encountered when operating IS in other countries
13	Managing and reconciling cultural and national differences	Cultural and national differences of countries where foreign affiliates operate could make software development, technology transfer, IS operations and information exchange difficult. These differences include languages, habits, customs, values and laws.
14	Improving the effectiveness of software development	Many organizations are becoming impatient with the old software development methods. However, new methods and platforms are still not yet proven. In the international context, although quality and standardization of software development are important, the affiliates may also need to be aware of the country variables such as different legal and accounting systems. These may definitely may affect software development within the affiliate's country
15	Developing and implementing an information architecture	An information architecture is needed to identify the major information categories used within an enterprise and their relationships to business processes. This architecture is especially important for the MNCs in the international IS operating environment as it guides their IS headquarters and foreign affiliates in developing global applications and facilitating the integration and sharing of data
16	Managing TDF restrictions	Foreign affiliates may encounter different TDF restrictions within their IS operating country. These restrictions may pose obstacles for information exchange between MNCs and their affiliates and subsequently the future IS development, investment and operations of foreign affiliates
17	Using IT for competitive advantage	IT has long been considered to possess the capability to generate new opportunities for organizations to secure greater competitiveness. However, in the less developed countries where foreign affiliates operate, it may become necessary to be aware of the possibilities and implications of these IT-enabled competitive advantages
18	Implementing and managing collaborative support systems	For MNCs and foreign affiliates to make faster and more effective decisions, collaborative systems that support decision makers from foreign affiliates and headquarters in information sharing and team collaboration become important. To provide such support, the MNCs must ensure their foreign affiliates have already implemented a distributed ubiquitous computing environment
19	Planning and integrating multivendor open systems	It is already a trend for MNCs and other organizations to move away from a single-vendor proprietary operating environment to vendor independent open systems to take advantage of industry standards. With these open systems, the foreign affiliates will be able to develop a homogeneous compatible processing platform with their MNCs. However, due to the large investment in legacy systems in the headquarters and foreign affiliates, carefully planned migration paths are critical
20	Managing and controlling IT transfer	Transferring technology from the headquarters to the foreign affiliates may be problematic due to lack of expertise, vendors, experience and so on. However, the affiliates must find ways to promote, consult or transfer innovative technology to their sites to increase IS productivity and resource sharing with other international offices

fication of panelists who were intended to be either MIS Directors or MIS professionals responsible for IIS activities. The names of these persons were determined by calling 500 MNC affiliates randomly chosen

from the *Principal International Business 1997* index [26] in Hong Kong. We then phoned them to seek their agreement to participate in our study, after explaining to them the objectives and importance of this effort. A

total of 202 contacted MIS professionals agreed to work with us, as they all believed this could contribute to the field of IIS.

The second phase of panelist selection involved their screening. We understood that unqualified participants, such as those who have little IIS experience, could seriously affect the accuracy of the findings. Hence, we mailed all participants a short open-ended questionnaire requesting them to describe their job nature, years of IIS experience, involvement in IIS activities and the nature of their business. In 2 weeks, 131 responses were returned. Non-respondents were contacted by phone and another letter. After 1 month, 192 participants had mailed back their questionnaire and agreed to participate in our Delphi study. We carefully read all the responses and identified 46 unqualified participants, either because their companies were not MNC affiliates or because they were not involved in IIS activities. The removal of these participants gave us a total of 146 final panelists.

The main objective of our three-round Delphi study was to identify and rank the major IIS issues that affiliates must face in the next 3–5 years. In the first-round an initial list of important IIS issues, derived from prior studies, were mailed to the panel members for evaluation based on a seven-point Likert scale. Upon receipt of the returned responses, the ratings were averaged over all respondents and their comments were summarized by issues. In the second-round, each panel member was sent the revised list, the individual and group-round-one rankings, and the comment summary for each issue. Comments and rankings of the second-round were similarly summarized and returned to the panelists for round three. The results from round-three were used in the IIS analysis.

4. Results

4.1. Demographic data

There were 131 participants out of 146, responded to at least one-round of our three-round Delphi study, yielding a participation rate of 89.7%. Of all 146 questionnaires mailed in each-round, 112 useable responses were received in round-one, 107 in round-two and 124 in round-three.

Table 2
Profile of respondents

	Number of respondents	Percentage (%)
Headquarters		
North America	52	41.93
Europe	32	25.81
Asia	25	20.16
Other	15	12.10
Industry types		
Manufacturing	35	28.23
Services	75	60.48
Non-profit	14	11.29
Participant positions		
IS executives	89	71.77
Non-IS executives	35	28.23
International data processing operations		
Distributed	68	54.84
Centralized	36	29.03
Decentralized	20	16.13
Foreign involvement (foreign sales/total sales)		
<25%	61	49.19
≥25%	63	50.81

As Hong Kong is an international financial center supporting different investments from different investors, it is not surprising that our participants come from diverse backgrounds. As shown in Table 2, most of the affiliates were headquartered in North America (US and Canada), Asia (mostly Japan and Korea) and Europe (mostly UK, Germany and France). In terms of industry representation, the majority of participants came from services, including banking and financial institutions. In terms of positions, most participants held senior IS and non-IS management positions, this suggests a high reliability of our findings. As for IS structures, most participants used distributed processing systems to support their local and global activities. With regard to the level of international involvement, more than 50% of our participants were found to be heavily involved (greater than or equal to 25% of the international subsidiary sales) in international business operations.

4.2. Top 10 IIS issues

Table 3 shows the 20 most critical IIS problems that IS executives of foreign affiliates expect to face in

Table 3
Foreign affiliate's ranking of IIS issues

Issue nos.	Ranking of issues	Mean	S.D.
1	Building a responsive IT infrastructure	5.93	1.22
2	Developing and implementing an information architecture	5.74	1.35
3	Managing communication networks	5.67	1.18
4	Controlling and making effective data utilization	5.55	1.54
5	Managing international integration of technologies	5.34	1.29
6	Improving the effectiveness of software development	5.21	1.32
7	Planning and managing international IS	5.15	1.17
8	Managing and controlling IT transfer	5.04	1.32
9	Facilitating and managing business process redesign	4.93	1.23
10	Managing TDF restrictions	4.88	1.09
11	Managing centralized/distributed processing systems	4.71	1.45
12	Implementing and managing collaborative support systems	4.65	1.38
13	Planning and integrating multivendor open systems	4.61	1.42
14	Using IT for competitive advantage	4.57	1.02
15	Managing and reconciling cultural and national differences	4.37	1.47
16	Learning to conduct IS business in other countries	4.25	1.32
17	Aligning IS organization	4.04	1.49
18	Managing IS human resources	3.96	1.52
19	Facilitating and managing end-user computing	3.85	1.29
20	Dealing with currency and exchange-rate volatility	3.53	1.12

their IIS management and operations. Examination of their ratings shows that standard deviations of all issues consistently decreased over the three-rounds, suggesting an improvement in the consensus level among our respondents. The mean ratings of top-rank issues increased round by round while those of lower-rank issues showed a gradual decrement. These general movements of top and bottom issue ratings over the three-rounds are of course normal in Delphi studies but they suggest a differentiation of the relative importance of specific issues confronting foreign affiliates.

The top three IIS issues rated by the foreign affiliates were not surprisingly *IT infrastructure* (#1), *information architecture* (#2) and *communication networks* (#3). These rankings strongly signify that the most significant concern of IIS management is the building, developing, and implementing of an efficient IS platform and network link for the affiliates to conduct core business and IS activities. In fact, Niederman et al. [12] discovered the rising importance of technology infrastructure issues in their 1990 study. Since then, almost every subsequent study has continued to rank technological issues as the top concerns. However, it is rare to have four (with #5 *integration of*

technology) of the top five issues taking on a technical flavor in the key issue framework.

Affiliates are operating in environments that are less stable and developed, with perhaps, inefficient communication networks and backward IT infrastructures. Such technological restrictions can have many detrimental effects on the affiliates, including hampering IIS strategic decisions, increasing IS costs due to inefficient handling of IT resources, causing high error rates during data transmission, adding difficulties for systems maintenance and increasing the complexity of technology transfer and integration. If these technology infrastructure issues are unresolved, foreign affiliates would not be able to take advantage of economies of scale and cost efficient telescoping of time and distance through IT. Thus, affiliates urgently need to build a responsive information infrastructure, the thrust of IS management, to support their existing and future applications. Ideally, this infrastructure has to be sufficiently flexible to withstand possible political, economic and technological changes that are imminent in the developing countries where most affiliates operate. Without the support of a reliable and flexible information infrastructure, affiliates would not be able to develop their information architecture

to guide global software development, resource sharing and data integration. When information infrastructure and IT architecture are not solidly implemented, the affiliate's data and resources will be scattered throughout the affiliate's computing sites without a plan, making the distribution process and data integration impossible. Unfortunately, resolving these technology infrastructure issues is not readily achievable in the affiliate's countries, due to their technological, economic, cultural and political restrictions.

Hong Kong is one of the most prosperous cities in the world, equipped with well-developed and advanced information infrastructure and communication systems to facilitate business transactions and trading. If affiliates operating in Hong Kong still found technology and infrastructure issues to be their critical concerns in IIS management, the seriousness of these issues would definitely be intensified in other countries.

The top non-technical issue identified by affiliates was *controlling and making effective data utilization* (#4). In fact, data utilization is not a standalone issue. It is closely related to several 'harder' technical issues, especially information architecture. Without properly designed information architecture to identify the major information categories used within the enterprise and their relationships to business processes, the affiliates would not be able to plan and manage data resources effectively. This is especially true when the affiliate's data resources are written in different languages. Making these resources accessible is perhaps a difficult mission, especially when they have to be translated to be understandable to users in the headquarters and other affiliates. Moreover, many affiliates need to deal with transborder data flow (TDF) restrictions and regulations, these impose additional hardships in effectively utilizing and transmitting data internationally. Despite these difficulties, affiliates still have to develop new methods to encourage intelligent integration of disparate streams of information for the purposes of making better decisions. This is especially true for those affiliates in the service sector whose key business is to process data and information.

Improving the effectiveness of software development (#6) represents another technical problem affiliates have to resolve. The source of this problem lies in

the cultural differences including the customs, languages and values of local countries. Although, the quality and standardization of software development are important considerations, the affiliates must be aware of the country variables. Sometimes local legal and accounting systems will force affiliates to redesign the applications developed elsewhere. Not all the affiliate's IS professionals know the home country's language. Therefore, extra effort is needed to translate the home country software into the local language, rather than fine-tuning the applications to become more efficient. Very often, new technical problems occur due to the translation process, these may eventually cause the affiliate to sacrifice effectiveness for possible implementation. As indicated by many participants, affiliates lack well-planned strategies to guide new application development and legacy software maintenance. In fact, not very many affiliates have integrated new development technologies such as CASE and object-oriented tools, into their standard software development procedures.

IIS are distributed data processing systems that cross national boundaries. Hence, *planning and managing IIS* (#7) becomes a challenge as these systems are exposed to wide variations in business environments, availability of resources and technological and regulatory environments. Affiliates are not only faced with a confusion of approaches, hardware and applications in their international IS operations, they are also faced with the pressures for global IS integration and local responsiveness. To achieve global integration, the affiliates must make strategic decisions to maximize the collective organization so that IS activities are integrated across national boundaries. However, these global integration forces may conflict with the local responsiveness needs which require affiliates to respond predominately to each local country setting irrespective of the strategic consideration of the home country and other foreign affiliates.

Managing and controlling IT transfer is ranked (#8). IT transfer does not only involve the 'hard' forms of technology but also the knowledge and other 'soft' aspects of technology. These 'soft' transfer issues which include the programs, covenants, rules of conduct and use and the know-how are the major challenges of the transfer of innovative IT to the host country. The affiliates also found variations in the societal culture of host-home countries, in their

absorptive capacity, in the antecedent characteristics of the particular technology and in the organizational cultures between the transacting organizations. Insofar as technology is conceived as firm-specific, tactical and cumulative in nature, technology transfer will involve significant resource costs, reflecting the problem of replicating knowledge across the boundaries of firms and countries [21]. Despite all these restrictions, IT transfer activities will become more frequent and significant as the global business environment becomes more competitive and the relationship of home-host countries becomes more interconnected. This is especially true for affiliates when they are more internationally involved and newly established.

Facilitating and managing business process redesign (BPR) is ranked (#9) in importance. When global competitive pressure increases, the role of affiliate's IS function begins to evolve to adjust to the ongoing massive changes in the local and global environments. As stated by the participants, one of their top priorities is to assess the avenues to which IS strategies should be integrated into their business strategies so that the organization might secure competitive advantages from more proactive uses of IT. Some participants mentioned that their BPR projects are mostly confined to technology infrastructure issues such as improving the efficiency of their information architecture, making their infrastructure more responsive, optimizing their distributed IIS and streamlining their software development process. At the time of the study, the extent of the participant's projects was still local but many participants mentioned that these would be extended to support their MNC's BPR activities on IS and business reengineering.

To establish an IIS to facilitate transfer of data across border, MNCs and their affiliates must devise effective plans to *manage TDF restrictions* (#10) As stated by many participants, TDF restrictions can have many detrimental implications for foreign affiliates. These include impeding strategic IS decision making, duplicating IT resources and IS personnel, boosting opportunities for data privacy violations during transmission and adding staff to ensure compliance with existing TDF regulations. The issue of TDF is heightened as the impact of converging communications and computer technologies becomes more pervasive. A recent study performed by Lai and Floyd [10]

verifies that the seriousness of TDF restrictions has been intensified. Their findings reveal that more MNCs and affiliates are now considering the TDF issue to be a 'current' rather than a 'potential' problem. Compounding the situation is the lack of uniformity of these laws and regulations across nations. Faced with such diverse problems, the affiliate's local and international IS operations will definitely be affected. Despite this, the affiliates must still recognize the legitimate concerns of all nations exercising TDF restrictions and conform to each country's guidelines.

5. Discussion

5.1. Analysis by participants

Executives normally perceive IS activities and priorities differently, due to mainly their different educational backgrounds and work experience. These differences perhaps will have a significant influence on their approach to problem solving and their perspective of management issues. In this study, Kendall's Tau coefficient analysis was conducted to evaluate the ratings of IIS issues by IS and non-IS executives. The result was statistically significant at $P < 0.001$, indicating that IS and non-IS executives have different ratings of IIS issues. To explore how individual issues differed, a follow-up Scheffe multiple comparison test was performed. The results suggested that eight IIS issues were rated significantly differently by IS and non-IS executives ($P < 0.05$). An analysis of these issues reveals that IS executives tended to give higher ratings to technology issues while non-IS executives tended to evaluate management issues more highly. For example, IS executives rated *technology integration* (#2), *software development* (#4) and *open systems* (#9) very highly while non-IS executives only ranked them (#7), (#9) and (#16), respectively. On the other hand, non-IS executives perceived *data utilization* (#2), *IT transfer* (#5) and *business process redesign* (#7) to be much more important than did IS executives. The other two issues that were ranked significantly differently were *TDF restrictions* and *IT for competitive advantage*. The non-IS executives believed these issues to be much more important.

5.2. Analysis by industry

The literature in international studies indicates that organizations are not equally influenced by IIS issues. Usually they classify industries into manufacturing and service sectors, assuming that the problems facing them are somewhat different. However, not all prior IS studies agree. Deans et al. [5] suggest that researchers should look carefully at the industry difference, perhaps by adopting a finer level of industry classification to detect salient variations. In this study, Kendall's Tau statistical analysis was performed to determine whether the IIS rankings were different among the manufacturing, service and non-profit affiliates. The results ($P = 0.21$) did not indicate any significant difference. MNCs normally will maintain sales and marketing offices in Hong Kong regardless of whether their businesses are in the manufacturing, non-profit or service industries. The role of their affiliates is to coordinate all their MNC's business activities and financial transactions in Asia-Pacific regions, including China and Japan. Hong Kong's rental and labor costs are simply too high, perhaps among the highest in the world. Hence, it is not economic to establish and operate a manufacturing plant. When all manufacturing affiliates in Hong Kong exist in the form of sales offices, their business and IS operations become similar to service and non-profit affiliates. That may be one possible reason why this study could not detect any difference between industry types and their IIS rankings.

5.3. Analysis by IS structure

IS structure can be classified into three categories: centralization, decentralization and distribution. In the context of IIS, centralized IS refers to the centralization of all computing activities and resources in one location, normally in the MNC's country. Decentralized structure is the least centralized, with the control of data, application development, maintenance etc. decentralized to the host country. Distributed IS is designed with the same basic configuration as centralized systems but with the affiliate's IS units having their own computing capabilities, storage devices and databases. Then, the headquarters IS unit is ultimately responsible for the control and the coordination of processing activities at all corporate levels [20].

Empirical findings on the impact of IS structure on IIS operations are inconclusive and somewhat contradictory. Some researchers (such as [9]) have indicated that a decentralized IS structure can accommodate IIS more easily than others. A decentralized system can also better accommodate cultural, social, political and economic differences among the host countries' legal provisions. Other researchers (like Karimi and Konsynski) suggest that a centralized system is preferable to other IS structures: MNCs are able to strive for global efficiencies and the opportunity to harvest worldwide economies of scale. However, there are other researchers (such as Lai and Floyd) who have found distributed structure more appropriate due to its ability to foster quicker response time, lower operating costs, improved data integrity, increased reliability and resource sharing.

Here, we do not intend to explore the effectiveness of different IS structures. We only want to investigate the correlation of the affiliate's IS structure and their IIS rankings. Hence, Kendall's Tau correlation analysis was performed to evaluate this relationship. The results ($P = 0.19$) did not reveal any significant difference in IIS rankings by affiliates using different IS structures. This is perhaps because Hong Kong is a developed international city with advanced information infrastructures and sophisticated communication networks. Almost all government regulations and economy policies are formulated to encourage and support international trade. Hence, affiliates can operate their IS activities effectively and efficiently without worrying about the restrictions associated with different IS structures. Additionally, the small IS operation scale and the high international experience level of IS professionals of affiliates may have caused the IS structure to have no influence on the IIS rankings.

5.4. Analysis by international involvement

Prior studies indicate that the level of international involvement has an effect on the ratings of IS issues. Here, the extent of the affiliate's international involvement is defined as the international percentage of subsidiary sales. The same measurement has been adopted by other researchers (such as [14]) in studying the international involvement of MNCs and global subsidiaries. Kendall's Tau was applied to detect the

correlation of IIS ratings by affiliates of high and low international involvement. The results ($P = 0.001$) indicate that the rankings of these two groups of affiliates differ significantly. To detect which individual issues cause such variation, a follow-up Scheffe multiple comparison was performed. There are four issues that were rated significantly differently at $P < 0.05$.

First, high international involvement affiliates rank (#4) consistently rated *IT transfer* higher than did the low involvement affiliates rank (#11). This is possibly because high involvement affiliates have more heavy international business transactions and IS operations. Consequently, they demand more technology transfer to support these activities in the host countries. Second, low internationally involved affiliates did not perceive *TDF restrictions* rank (#12) to be as important as did high involvement affiliates rank (#5). Apparently, low involvement affiliates do not require heavy use of international information to support their business operations and their information exchange need may be reduced, thereby diminishing their exposure to TDF restrictions. Third, high

international involvement affiliates rated *integration of technologies* (#3) much higher than did the low involvement affiliates (#10). The reason is, once again because of the frequent need for international information exchange. To ensure the efficiency and effectiveness of information exchange and data processing, a well-integrated international platform of information architecture is obviously important. Fourth, high involvement affiliates are more concerned about the *cultural and national differences*. They rated this issue (#10) as compared to the (#17) of their counterpart low involvement affiliates. This difference of rating is possibly caused by the extent of business transaction frequency with other countries.

5.5. Impact of IIS issues on decision making

Many researchers (such as Sambharya and Phatak [16]) believe that IIS issues affect the strategic, administrative and operational IIS decisions. Lai and Floyd also noted this concern and believed such effects could damage the affiliates' competitive positions in overseas countries. However, little has been done to

Table 4
Impact of IIS issues on decision

IIS Issues	Pr > F		
	Operational	Tactical	Strategic
IT infrastructure	0.043*	0.024*	0.000**
Information architecture	0.000**	0.005**	0.000**
Communication networks	0.018*	0.402	0.211
Data utilization	0.042*	0.001**	0.029*
Integration of technologies	0.000**	0.000**	0.021*
Software development	0.000**	0.048*	0.092
International MIS	0.532	0.025*	0.014*
IT transfer	0.421	0.036*	0.028*
Business process redesign	0.312	0.042*	0.000**
Transborder data flow restrictions	0.237	0.439	0.215
Processing systems	0.042*	0.781	0.355
Collaborative support systems	0.196	0.863	0.617
Multivendor open systems	0.020*	0.391	0.562
Competitive advantage	0.182	0.002**	0.002**
Cultural and national differences	0.511	0.194	0.003**
IS business in other countries	0.248	0.628	0.416
IS organization alignment	0.631	0.471	0.363
IS human resources	0.073	0.031*	0.551
End-user computing	0.021*	0.006**	0.312
Currency restrictions and volatility	0.827	0.646	0.741

* P -value significant at 0.05.

** P -value significant at 0.01.

explore empirically how IIS issues impact the effectiveness of IIS decisions. Therefore, we asked our participants to evaluate the perceived impact of each IIS issue on strategic, tactical and operational IS decisions. Prior to the performance of any statistical analysis, Cronbach's alphas were first calculated to determine the reliability of the decision variables. This showed that the variable reliability was significantly higher than the 0.5–0.6 range suggested by Nunnally [13] for early stages of basic research. Then, three regression analyses were performed to regress IIS issues on the mean scores of the strategic, tactical and operational decision variables respectively.

As shown in Table 4, IIS issues are found to have a significant (all at $P < 0.01$) impact on the operational, tactical and strategic IS decisions. At the operational level, nine issues (three at $P < 0.01$ and six at $P < 0.05$) were significant in IS decisions; at the tactical level, 11 issues (five at $P < 0.01$ and six at $P < 0.05$) and at the strategic level, nine issues (five at $P < 0.01$ and four at $P < 0.05$). An analysis of all significant issues at the three decision levels allows us to generate four observations. First, technical issues are more important determinants of IS decisions than are management issues. Second, top IIS issues are more influential in IS decisions than are lower-ranked issues. Third, *IT infrastructure, information architecture, data utilization and technology integration* are significant IIS issues at all three decision levels. Fourth, *communication networks* is the only top-five issues significant to one decision level (operation), while the other top-five issues are significant at all decision levels. Based on these observations, the foreign affiliates must realize that, in the international context, they have to maintain good control of technology-oriented IIS issues to ensure that information exchange can be performed efficiently.

6. Implications and conclusions

This study represents a step in capturing data from affiliates that have exposure and experience in IIS management. This paper represents an attempt to identify, rank and evaluate the IIS issues for IS professionals practicing in affiliates. Our empirical findings indicate that IIS issues can significantly impact IS decisions at the strategic, tactical and operational

levels, suggesting the importance of the international dimension of the affiliate's IS operations. Unfortunately, most of the existing IS planning theories have seldom considered these IIS issues.

Several of the top IIS issues ranked by affiliates are identical to the top IS issues encountered by the major MNC office. The country-specific concerns have received very low ratings, indicating the lack of importance of these issues in the affiliate's IS operations. This finding is contradictory to many studies performed in the management, IS and other business disciplines. Why do affiliates in this study share the same IS concerns as their headquarters? The possible explanation is that Hong Kong is an international city following an open economy policy that is very similar to the economy structure of the US. Moreover, Hong Kong as a former British colony, is influenced by both oriental and western cultures. This cultural advantage plus the advanced information and technology infrastructures of the city, has allowed Hong Kong to develop into a perfect location to orchestrate the MNCs' international business activities in the Asia-Pacific region. When the economy, culture and infrastructure environment are compatible with the affiliate's home country, the country-specific IIS issues will become less significant and require less attention. Not all affiliates, however can operate in countries like Hong Kong. Some affiliates have to conduct their businesses in developing or underdeveloped countries where they have to confront not only country-specific problems but also technology-oriented issues.

The IS issues studies in the 1980s showed that technological issues were of less concern than managerial issues. These studies also indicated that this trend would continue, especially when the organizations became more internationally involved. However, recent issues studies have indicated that this trend did not continue.

The literature of international organizational structures reveals that MNCs and affiliates have adjusted their IS structures to deal with different IIS issues. In the IIS context, centralized structure affords greater efficiency and standardized controls as well as organizational integration, decentralized structure provides local decision makers with greater control and responsiveness to local business decisions, while distributed structure offers greater flexibility and encourages cooperation between affiliates of different

countries. However, this study does not find any significant relationship between IIS issues and the affiliates' IS structures.

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