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MANAGING DISTRIBUTED INFORMATION SYSTEMS RESOURCES IN A GLOBALIZED ENVIRONMENT

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Abstract

Research on international information systems suggests that alignment between IS service structures and the organizational structure is an important but complex issue. Little empirical work has been done, however, to identify how such alignment might be achieved. This paper reports on the results of a study examining the organizational factors which might be expected to have an impact on the alignment of IS resources in MNCs. Based on previous international research, nineteen factors are proposed and discussed through eight perspectives: organizational context, system owner, system goal, data, people, organizational structure, computer system and organizational environment. Finally, the results and findings of a questionnaire survey and case studies regarding the structural alignment issues of IS in MNCs are presented. These show that only three of these factors have a strong influence on structural alignment and relate to the internal consistency of the organization rather than the external environment. A number of secondary factors are also identified through the case analyses. The authors suggest that many of the proposed factors are based on out-dated principles and further suggest that the challenges of globalization are not fully understood by either practitioners or researchers.

1. INTRODUCTION

Today, the business platform of organizations is rapidly being transformed by globalization of the marketplace (Deans and Kane 1992; Cheung and Burn 1994). Firms find that this has changed the nature of their business (Ives and Jarvenpaa 1990) and increased the market size and competition. In order to survive in such an environment, many multinational companies (MNCs) use information systems (IS) to transcend local operations and facilitate the development of international trade by surmounting the barriers of time and distance (Roche 1992; Deans and Kane 1992; O'Leary 1992).

The emergence of multinational IS (MNIS) intensifies the problems faced in IS management by introducing the issue of international management across a number of cultural and political barriers, coupled with the sheer immensity of multinational IS services. This forces companies to focus on the management of international IS as one of the critical concerns for the nineties. Jarvenpaa and Ives (1993) argue that different types of MNCs will adopt different types of MNIS services (MNISS) structures, but they do not further identify variables which will affect the structural alignment of MNISS.

In this paper, we develop a research framework and from this framework propose some of the organizational variables in an MNC which may impact on the structures of MNISS. We then describe the results of a study using both questionnaire and case studies to validate these relationships and identify further factors which influence structural alignment. The study was completed in Hong Kong (HK), where many international companies are represented and so covers a wide range of ownership.

2. RESEARCH QUESTIONS AND FRAMEWORK

This study was designed to examine the factors affecting the MNISS structures in MNCs. Three primary questions were addressed:

(a) What organizational variables may affect the MNISS structure in MNCs?

(b) In what way do these variables influence the MNISS structure in MNCs?

(c) How critical are these variables in affecting the MNISS structure in MNCs?

In order to examine these questions, a comprehensive research framework was required which could identify all the issues relevant to the management of IS resources. The approach taken

was to review IS definitions proposed over the last two decades and identify the common features and converging trends. This showed that there has been increasing emphasis on the social aspects of IS rather than the technical issues and so a socio-technical approach was used to evaluate the definitions and arrive at a comprehensive definition of IS. The approach chosen was CATWOE analysis (Checkland 1981; Checkland and Scholes 1990). Checkland argues that a complete description of a system should address six elements: Customer (C) — the beneficiary or victim in the system's activity; Actor (A) — a person who carries out one or more of the activities in the system; Transformation (T) — the core of the transformation process; Weltanschauung (W) — the image or model of the world which makes this particular system a meaningful one to consider; Owner (O) — the person(s) who could modify or demolish the system and; Environment (E) — impositions which the system takes as given. Applying this to previous IS definitions, as shown in Table 1, several interesting facts emerged.

First, systems owner is missing from all definitions. Second, Angell and Smithson (1991), Land (1992) and Ives, Hamilton and Davis (1980) all share a common view of IS components as people, data, computer systems, policies and procedures within some organizational context. Third, those definitions which emphasize the "people" role (Mason and Mitroff 1973; Davis 1974; Buckingham et al. 1987) see the customer as the person(s) with the problem in a specific organizational environment and, finally, Checkland and Scholes agree with Mason and Mitroff that the successful outcome of a system will be when relevant information leads to purposeful actions.

Combining these, a research framework (Cheung and Burn 1995), as shown in Figure 1, argues that IS exist in an organizational environment composed of four groups of elements: people, data, computer systems, policies and procedures. Within the organizational environment, IS is directly associated with systems owner, organizational context and purposeful action (systems goal). Therefore, IS management can be viewed as the coordination and integration of the IS related elements (that is the four groups of IS elements and the three environmental variables) to achieve the predefined goals of the IS.

In this paper, the decision on how to manage the MNISS in an MNC is interpreted as the policies and procedures component of the MNIS; the structure of the MNISS will be an integral part of the management. This paper focuses on *how the other seven components in the research framework affect the alignment of MNISS structures in MNCs.*

3. MNISS ALIGNMENT

Previously, debate on MNISS structural issues has centered around two conflicting needs: the centralization of MNISS in response to the need for headquarters to ensure control over the activities of their subsidiaries and the decentralization of MNISS to provide autonomy to subsidiaries to react to local market conditions (Freedman 1985; Raptis and Collins 1986; Contractor and Narayanan 1990).

However, the authors contend that it is too simple to examine this issue solely through the opposing structures of centralization or decentralization. Instead, centralization and decentralization of MNISS should constitute the two extremes of a continuum. The location of MNISS in the continuum is associated with a number of factors related to the predefined research framework: organizational context, systems owner, systems goal, data, people, computer systems and organizational environment.

3.1 Organizational Context

The location of decision making requires different levels of information processing capacity among various corporate units (Habib and Victor 1991; Roche 1992), hence, different degrees of IS centralization/decentralization are required to meet the needs. Also, the greater the level of international involvement of the MNC, the greater the degree of heterogenous environment that MNC will face. IS decentralization can assist subsidiaries in coping with individual environments.

Gates and Egelhoff (1986) argue that centralization (of an MNC) is negatively correlated with the level of foreign product (services) diversity in an MNC. Since the production processes for standard products (or operation processes for standard services) should be the same throughout the world, it is more efficient to concentrate all the vital activities, such as IS, inventory control, decision making and product design, in one area to facilitate top management control.

Finally, Buss (1982) points out that different levels for IS maturity within the MNC group will affect the subsidiaries in implementing their IS and, where a high variation exists, decentralization of IS services may be the only solution.

3.2 Systems Owner

A view of the world that is homogeneous will influence top management to adopt a global strategy, produce standard products, have a philosophy of full control over the subsidiaries and efficiently use resources. Therefore, the resultant effect on the structure of MNISS is that centralization is more suitable for a company with a homogeneous view of world and a management philosophy of centralized control, whereas a view of the world that is heterogeneous will lead top management to adopt a multidomestic strategy, produce diversified products and decentralize authority and MNISS to the subsidiaries.

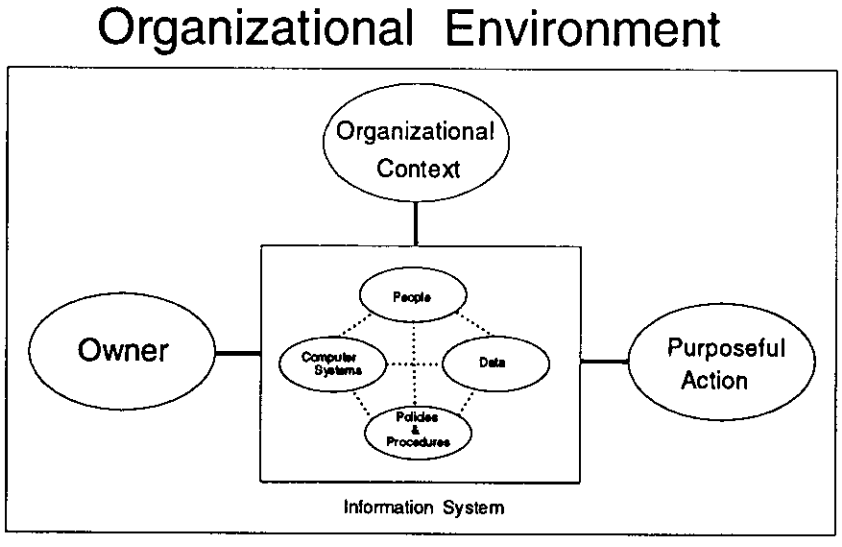

Figure 1. IS Management Research Framework

3.3 Purposeful Action (System Goal)

Centralized MNISS tends to facilitate efficiency in the use of the company's resources, such as money, people and data, by sharing these resources among various units in order to reduce duplication (Norton 1973; Tavakolian 1991). Centralization can also help MNCs to supervise information access and achieve a large measure of control over subsidiaries by restricting the supply of information to them. Centralization, therefore, favors efficiency and control. Decentralization supports effectiveness and local autonomy.

3.4 Data

The greater the degree of data sharing, the more centralized MNISS should be to reduce duplication. Researchers (Zmud 1984; Lee and Leifer 1992) contend that all the unshared data should be decentralized into subsidiary locations to enhance the sense of data ownership within MNCs. This can encourage the owners of the data to fully explore the potential of the IS in order to maximize the competitive ability of the MNC. Centralization, however, generates an environment where it is much easier to ensure data standards (Butler Cox Foundation 1986).

3.5 People

Centralization can assist in creating an attractive environment for specialized technical staff by providing richer technical IS career path opportunities so that it is easier to reduce vulnerability in turnover of specialized staff in order to maintain a more professional, cheaper and high-quality operation. On the other hand, decentralization encourages the transference of knowledge from IS staff to users and vice versa as expertise is located close to the users (Contractor and Narayanan 1990).

Moreover, different levels of technology development and education infrastructures means that the required IS skills may not be available in all countries or not to an equal standard. Hence, if suitably qualified IS staff are only available in the headquarters, IS services should be centralized to make it easier to carry out technical support and development activities or decentralized if suitable IS staff can only be found in subsidiary countries.

Finally, the salaries of IS professionals are largely dependant on the economic situations of countries where the IS professional is hired. In countries which are economically strong or well developed (e.g., Japan, the U.S.A. and the U.K.), the salaries of IS staff are much higher than those in countries which are economically weak or less developed (e.g., India, Philippines and China). Using the lowest cost policy, centralization of IS should be implemented if the cost of skilled labor is lower in headquarters countries; if the cost of labor is lower in subsidiaries, decentralization of IS should be carried out.

3.6 Computer Systems

The required hardware and software may not be available in all countries (Buss 1982). This hardware and software availability problem is further intensified by factors of national protectionism, transportation problems and so on. Therefore, centralization of resources will necessarily relate to the availability of the required hardware or software.

Table 1. CATWOE Analysis of IS Definitions

IS Definitions	C	A	T	W	O	E
Mason and Mitroff (1973)	Person with problem	—	Unsolved problem to solved problem	Well presented data can help people to solve their problems	—	Only person with certain psychological type can use the system Problem exists within some organizational context
Davis (1974)	People in organization	Man with machines	Informationally unsupported functions to informationally supported functions	Information can improve the organizational functions performance	—	It uses computer hardware, software, manual procedures, management models, decision models and database
Ives, Hamilton and Davis (1980)	—	—	—	IS is a collection of subsystems	—	Defined by functional or organizational boundaries May or may not use machines
Buckingham, et al. (1987)	People in organizations	—	People cannot access desirable data to people can access desirable data	People with useful information can improve their performance	—	Information processed must be relevant to a particular organization
Checkland and Scholes (1980)	—	—	Unattributed data to attributed data	Relevant information is important for the success of purposeful action	—	It is only meaningful and relevant to particular groups of actors in a particular situation
Angell and Smithson (1991)	—	—	—	—	—	It consists of computer systems, users, information, policies, procedures and organizational structure The behavior of IS is heavily influenced by the goals, values, and beliefs of individuals and groups
Land (1992)	—	—	—	—	—	IS consist of organizational structure; communication channels; facilities; apparatus; software tools; training, advisory and help facilities provided to users IS exist in a real world which consists of objects, people, rules, norms and commands (organizational environment)

The costs may also vary according to the geographic location (Janczewski 1991). Different costs may be due to differences in manufacturing cost, import tax, export tax, national protectionism, economic situations of the countries, transportation costs and so on. Obviously, IS resources are frequently distributed according to the cheapest policy.

Finally, centralization can provide a large-scale information processing capacity to the MNC and reduce the costs of duplication, whereas decentralization can reduce the communications costs for the transference of data between headquarters and subsidiaries (Deans and Kane 1992).

3.7 Organizational Environment

MNCs are often accused by host governments of using monopolistic power to crush competition and of gaining favorable credit ratings for investment, thereby competing for scarce capital with domestic industry. Host governments have, therefore, sought to exercise control over multinational corporations operating under their jurisdiction (Negandhi and Palia 1987). One of the ways by which they try to exercise control on MNCs is to require MNCs' technology and manufacturing processes to be adapted to local standards (Hamel and Prahalad 1983). This is more easily effected in a decentralized IS environment.

Transborder Data Flow (TBDF) refers to the transportation of data from and to a country in any format electronically, magnetically or textually. Due to various reasons of security, protectionism and privacy, some countries prohibit the export of data in any format to other countries (Deans and Kane 1992). As a result, MNCs are forced to decentralize IS.

Furthermore, setting up IS services in subsidiaries will involve a huge amount of investment from the MNCs, therefore the economic, political and social stability of the home and host countries should be taken into consideration in the centralization or decentralization of IS. If the headquarters are established in an unstable country (this could be said to be the case for HK-based MNCs in the run up to 1997), the IS should be decentralized into subsidiaries to reduce the risk of losing control of the corporate information and the expensive IS components, such as hardware, software and documentation.

Where joint ventures exist, the foreign parties in an MNC may exert pressure to adopt their policies and standards such that the MNC has to cope with two or more sets of policies and standards within the group. Decentralization is one way to facilitate the MNC to implement different policies and standards at the same time. Subsidiaries can then carry out the foreign parties policies and standards in order to adapt to the local markets.

The greater the differences among countries, the greater the difficulties for a single integrated MNIS to handle all the regional differences, such as the differences in peoples' working styles and practices, legal systems, languages and so on. It is suggested that, the greater the level of differences among countries, the greater the level of decentralization that should be implemented in order to screen out the effect of regional differences from the headquarters' IS.

Table 2 summarizes the discussion above and Figure 2 represents this graphically.

4. THE RESEARCH STUDY

A research project to investigate the influences of the proposed organizational variables on the structural alignment of the MNISS with the MNC was conducted in three stages. Stage one of the study was a questionnaire survey to obtain a general overview of the issue from a variety of MNCs. In stage two, through a number of in-depth case studies, a complementary study was carried out in the express courier industry to understand the issue in companies with similar external environments and business operations. Finally, four mini-cases, selected for their interest value and to provide a cross-industry view, were completed. In the following sections, the findings of the questionnaire survey and the case studies will be reported.

4.1 Questionnaire Survey

A questionnaire was developed and construct validity and reliability were tested using a number of different methods. A pilot study was completed and the questionnaire redesigned after feedback; dual questions with different phraseology and contradictory questions were introduced; six companies were asked to complete two sets of questionnaires with different respondents to assess compatibility. The full survey was carried out at the end of May 1994. The questionnaires were mailed to one thousand MNCs in HK. Finally, only seventy-five fully completed questionnaires were returned, giving a response rate of 7.5%. (This must be viewed as satisfactory compared with other response rates in HK, such as 7% turnout for local district board elections.) As seen in Table 3 the location of the headquarters of the responding MNCs shows a fairly widespread representation of the HK business scene.

The answers in the questionnaire were examined separately through three IS dimensions: systems development, systems management and systems operations. Moreover, data were analyzed through three tests:

(a) Contingency table test, which shows only the percentage cross-tabulation of the two variables. This is the first stage of data analysis to allow the authors to carry out some visual inspections to figure out any clustering among the two testing variables.

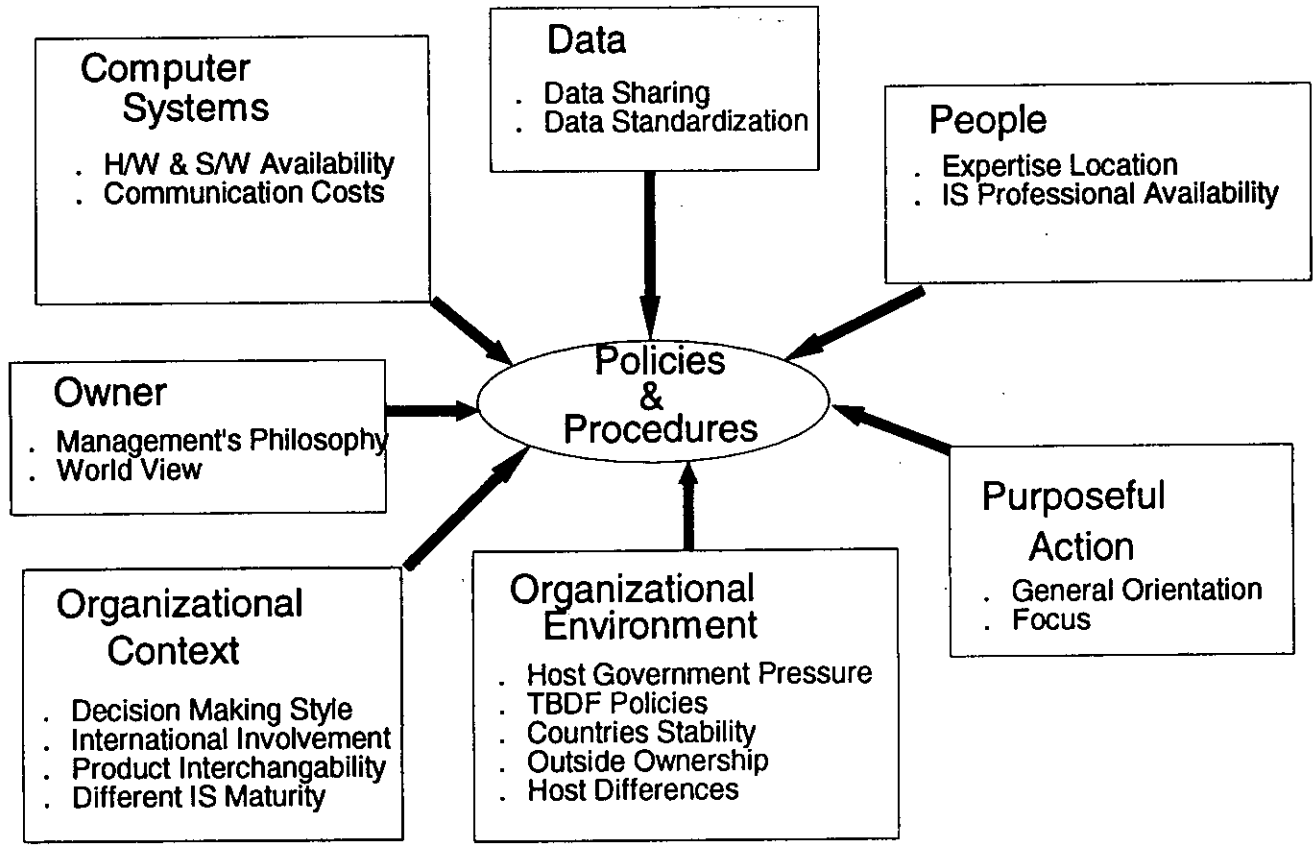

Figure 2. The Research Hypotheses

(b) Chi-square (χ^2) test, which tries to test the actual distributions of the samples with an ideal distribution. χ^2 test requires the expected frequency in all the cells of a contingency table to be greater than or equal to five. Therefore, some variables were combined to achieve the minimal expected frequency in all cells as five. However, where cells still existed with an expected frequency lower than five after the adjustments, the results of the χ^2 test for that set of data were neglected (that is not applicable for using χ^2 test).

(c) Spearman's rank correlation coefficient (r_s) test, which analyzes the increasing or decreasing relationship between the two variables. An increasing association means that x and y are directly proportional, where a decreasing association means that x and y are inversely proportional. Furthermore, the degree of the association that exists between x and y will be represented by the value of r_s.

The summaries of the statistical tests are presented in Table 4.

Supportive Variables. From the proposed nineteen variables, only three proved to be related to the structures of MNISS. **The three variables are the degree of data sharing among the MNC groups, the degree of corporate-wide data standardization in the MNIS and the degree of differences in IS stage growth within the MNC.**

It can be argued that the issue of MNISS structure is one of technical focus rather than social focus, as MNC management not only does not give serious consideration to the organizationally related components of the MNISS, but also, as perceived in the interviews, is seriously confused about the most appropriate organizational forms.

Non-supported Variables. Because of the dynamics of the global environment, some of the variables proposed in the past may not be considered relevant to the MNIS centralization/ decentralization issue of today.

First, the improvement in education systems in various countries causes the availability of IS expertise and IS skills in different countries to be less relevant. In countries such as Singapore, Korea, Taiwan and HK, competition tends to be based on high technology and the level of IT literacy is very high. In other

Table 2. Pressures of IS Centralization versus Pressures of IS Decentralization

	Pressures to Centralize	Pressures to Decentralize
Organizational Context		
Decision Making Style	Central	Decentral
Level of International Involvement	Low	High
Degree of Product Interchangeability Between the Local Affiliate and the Rest of the Multinational Group	High	Low
Degree of Differences in the level of IS Maturity Among Multinational Groups	Low	High
System Owner		
Management's Business Philosophy	Centralization (Full Control)	Decentralization (Full Autonomy)
World View	World is Homogeneous	World is Heterogeneous
System Goal		
General Orientation	Efficiency	Effectiveness
Focus	Control	Autonomy
Data		
Degree of Data Sharing	Large	Small
Data Management Focus	Standardization	Local Variations
People		
Location of Expertise	Centralized expertise to maintain a more professional, cheaper and higher-quality operation	Decentralized expertise to facilitate knowledge transfer between IS staff and users
Availability of IS Professionals	Suitable qualified IS staff cannot be found in foreign areas	Suitable qualified IS staff can only be found in foreign areas
Computer Systems		
Availability of Hardware and Software	Required hardware and software cannot be found in foreign areas	Required hardware and software can only be found in foreign areas
Cost	Reducing duplication cost	Reducing communications costs
Organizational Environment		
Pressure from Host Government to Force Local Economic Involvement	Low	High
Transborder Data Flow Policies of the Host Government	Loose	Strict
Countries' Stability	Host countries are unstable	Home countries are unstable
Outside Ownership	Low	High
Degree of Difference Among Host Countries Environment (e.g., social value and language)	Low	High

Table 3. Informant's Categories by Locations of Headquarters

Locations of Headquarters	Frequency	Percent	Valid Percent	Cumulative Percent
Hong Kong	16	21.3	21.6	21.6
USA	28	37.3	37.8	59.5
Japan	10	13.3	13.5	73.0
UK	8	10.7	10.8	83.8
France	1	1.3	1.4	85.1
Germany	3	4.0	4.1	89.2
Denmark	1	1.3	1.4	90.5
Switzerland	1	1.3	1.4	91.9
Australia	2	2.7	2.7	94.6
Italy	1	1.3	1.4	95.9
New Zealand	1	1.3	1.4	97.3
Bahrain	1	1.3	1.4	98.6
Belgium	1	1.3	1.4	100.0
Missing	1	1.3	Missing	
Total	75	100.0	100.0	
Valid cases 74		Missing cases 1		

developing countries, such as India, Thailand and even China, government supported IT plans have greatly increased the development of IT and the supply of IT professionals. This, in fact, has led companies to outsource cheaper IT development (an estimated cost ratio of 8:1 between HK and China) rather than to distribute their IT shops in relation to the location of their company units.

Second, a reduction in international protectionism to promote worldwide economic growth has decreased the pressure from host governments and the strictness of TBDF policies regarding availability of required hardware and software. There is also the desire to compete in developing countries as new markets appear as clearly shown by the invasion of foreign companies into China. Furthermore, with exceptions in only a number of countries (such as Iran), equal and open trade is the main driver for international business practices, therefore, the availability of hardware and software is not a problem to an MNC. They can transfer the essential resources freely around the world, without too many restrictions, provided that the resources required cannot or do not carry any military significance. Finally, as the advancement of telecommunication technology decreases the cost per bit of transmissions, so the importance of telecommunication costs incurred in the MNIS will decrease and MNCs will not consider this variable in designing their MNISS structures.

An additional factor which reduces the impact of many of the factors relates to the level of utilization of IT within the MNCs surveyed. It was generally viewed as a support tool rather than a strategic driver and so was neither directly related to management philosophies nor highly integrated into the production processes.

Survey Bias. In order to test whether HK based MNCs exhibited different characteristics from foreign owned MNCs, the two groups were compared and found to be similar except in one respect. The average number of subsidiaries in the foreign-based MNC was 51 to 60, about five times the average size of their HK counterparts. This gave a slightly greater tendency for HK MNCs to centralize their systems development and management. Also, HK is regarded by some as an "unstable" environment with a change of sovereignty happening in 1997 and so it may be the case that foreign MNCs with HK subsidiaries are less prepared to delegate authority to the HK subsidiary.

4.2 Case Study

In order to test out these findings, and explore other factors which might not have been covered in the questionnaire, in-depth case studies were carried out in four express courier companies. Express courier companies were chosen as cases because most

Table 4. Statistical Summary of the Variables

	Decentralized Systems Development	Decentralized Systems Management	Decentralized Systems Operation
ORGANIZATIONAL CONTEXT			
Decentralized management	visually support	not support	visually support
High international involvement	slightly support	not support	slightly support
High product interchangeability	not support	not support	visually support
Different IS stages	fairly support	slightly support	visually support
SYSTEM OWNER			
Heterogeneous view	not support	not support	not support
Full autonomy preferences	visually support	not support	visually support
SYSTEM GOAL			
IS oriented to effectiveness	not support	not support	visually support
IS oriented to autonomy	not support	not support	not support
DATA			
Low data sharing	strongly support	statistically support	fairly support
Low data standardization	strongly support	statistically support	fairly support
PEOPLE			
Decentralized IS expertise	not support	not support	not support
IS skills in host only	not support	not support	not support
COMPUTER SYSTEMS			
H/W and S/W in host only	not support	not support	not support
Reduce communication cost	not support	not support	not support
ORGANIZATIONAL ENVIRONMENT			
Great pressure from host	not support	not support	not support
Strict TBDF policy	not support	not support	not support
Unstable home	not support	slightly support	slightly support
Great foreign ownership	visually support	not support	slightly support
Different hosts environments	visually support	not support	visually support

Key: The degree of support to the hypotheses is in the following order: strongly > statistically > fairly > slightly > visually > not

strongly support: the relationship of the two variables is supported by all three tests
statistically support: the relationship of the two variables is supported by χ^2 and r_2 tests only
fairly support: the relationship of the two variables is supported by contingency table and χ^2 tests only; or the relationship of the two variables is supported by contingency table and r_2 only
slightly support: the relationship of the two variables is supported by χ^2 or r_2 test only
visually support: the relationship of the two variables is supported by contingency table test only
not support: the relationship of the two variables is not supported by all three tests

Table 5. Summary of the Four Case Scenarios

	A	B	C	D
Organizational Dimension				
Date of Establishment	1969	1973	1907	1970s
Date of Internationalization	1972	1980s	1976	1975
Current Headquarters	Europe	USA	USA	Europe
Methods of Expansion	**Joint venture, New establishment**	**Acquisition**	**Acquisition**	**Acquisition, PTTs' Consortium**
Organizational Structure	4 layers' hierarchy (2 separate entities for USA domestic and international)	4 layers' hierarchy (1 entity to operate worldwide business)	5 layers' hierarchy (1 entity to operate worldwide business)	4 layers' hierarchy (1 entity to operate worldwide business)
Direct Contact between Subsidiaries	Minimal	Minimal	No	No
Geographical Strength	Far East, Australia	USA	USA	Australasia, Europe
Business Strategy Formulation	Centralized	Centralized	Centralized	Centralized
Business Strategy Implementation	Decentralized	Decentralized	Decentralized	Decentralized
IS Dimension				
IS Development	Centralized	Centralized	Centralize	Centralized
IS Strategy Formulation	Centralized	Centralized	Centralized	Centralized
IS Strategy Implementation	Decentralized	Decentralized	Decentralized	Decentralized
IS Operation	**Decentralized**	**Centralized**	**Centralized**	**Centralized**
Local Systems Development	**Minimal**	**Minimal**	**No**	**With approval**
Transfer of Local Development	**With approval and certification**	**No**	**No**	**With approval from upper level offices**
Direct Data Exchange	No	No	No	No
Computer Systems	**Decentralized UNIX based machine with distributed database**	**Centralized IBM mainframes with local PCS**	**Centralized IBM mainframes with local PCs**	**Centralized HP UNIX mainframes with local minis or PCS**

of the successful express couriers are truly multinational operators that rely heavily on IS technology to streamline their worldwide operations. Cases were studied based on three methods: semi-structured interview with the IS personnel, questionnaire and literature review. Because of confidentiality, the names of the four cases are not mentioned in this paper; instead, the symbolic names A, B, C and D are used respectively. Furthermore, because of the constraint on the length of this paper, details of each case cannot be described and only a comparative summary of the cases will be presented in the following sections.

Case Scenario Analysis. The company scenarios of the cases are compared and summarized in Table 5. All four cases have very similar company attributes, except for the methods of expansion, IS operation and computer systems. With regard to methods of expansion, companies B, C and D carry out a very similar strategy of acquisition and only company A uses a joint venture strategy. This may be a major factor causing the different structure of IS services in the companies. Company A is the only one to decentralize their computer systems and IS operation. Expansion by acquisition gives companies B, C and D complete authority to discard the old systems from the purchased companies and implement the IS from the headquarters straightaway. This allows the headquarters to gain control and become familiar with the new environment promptly. However, expansion by joint venture forces company A to deal with special requirements from the local partners and different local partners may impose different requirements on their partnerships. Therefore, a decentralized IS for company A can provide sufficient flexibility in coping with those additional and specific requirements imposed by the local partners.

From the case analysis, the methods of international expansion may be claimed as one of the most important factors in determining the structure of MNISS in MNCs. This was further tested by applying the questionnaire to each. The results of the questionnaire from the four cases are summarized in Table 6. Most of the selected variables show very similar levels of agreement except for the variables of IS oriented to autonomy, strict TBDF policy, unstable home country and degree of foreign ownership in foreign subsidiaries.

The disagreement of the IS design oriented to the subsidiaries' autonomy from company C is due to its company philosophy that operation of the business around the world is the same and there is no need to give operational autonomy to the subsidiaries. However, this variable does not play an active role in determining the MNISS structure as contradictory cases were obtained in companies B and D. Both have centralized systems but agree on the design of IS oriented toward subsidiaries' autonomy.

In addition, only company C indicates that they do not face very strict TBDF policy from local governments. This may be due to the fact that company C builds and operates its own satellite network. Furthermore, in some less advanced countries, company C will actively participate in building up the telecommunication infrastructure of that country to ensure that they will get sufficient privilege in utilizing the country's telecommunication network. However, this variable also does not play an active role as a contradictory case was obtained in company D, which has centralized systems but agrees on the strict TBDF policy imposed by the local governments.

Among the four cases, only company A indicates that it faces instability in its home country. Historically, company A had moved its operational headquarters from the Asia Pacific region to a European region. In order to keep the move as smooth as possible, the changes made to the organization of global IS were kept to a minimum. In fact, company A gave this as a major reason for maintaining decentralized systems.

The degree of foreign ownership in the foreign subsidiaries is dependent on the methods of international expansion, as discussed in the case scenario analysis; therefore, this variable will not be discussed here.

In conclusion, the questionnaire results indicate that the variables of stability of the home country and degree of foreign ownership in foreign subsidiaries have secondary influences on the structuring of IS in MNCs.

4.3 Mini-Cases

Four MNCs were selected from the initial questionnaire respondents for further study through interviews. These were a Japanese finance company (FIN), an American shipping company (SHIP), a Canadian manufacturing company (CLEAN), and a Swiss- owned but US-based manufacturing company (BODY). These four cases confirmed the strongest influencer to be the degree of data sharing within the MNC units, with three having only a minimal need for shared data, operating in a decentralized mode, and one with a very strong need (SHIP) requiring a centralized MNISS. They also confirmed a previous hypothesis from the questionnaire data that companies had to be highly dependent on their MNIS before clear and conscious direction was given with regard to the structure on MNISS. This was the case in SHIP and was in the process of evolving in BODY as a direct result of planning to give customers direct linkage to their IT systems. In both other cases, IT was purely a support tool.

In addition to confirming previous findings, these cases also identified a number of other variables which had not been suggested as influencers in the existing literature. These may be seen as tertiary factors: customer profile — local domestic or international — and process of internationalization — history of globalization. FIN did not offer cross-country services but one service in each country and so treated all customers as local; CLEAN and BODY expanded rapidly through acquisitions but

Table 6. Summary of the Questionnaire from the Four Express Giants

	A	B	C	D
Decentralized management	Agree	Agree	Agree	Agree
Number of Subsidiaries	218	176	175	180
Global products	75%-51%	75%-51%	100%-76%	100%-76%
Different IS stages	S. Agree	S. Agree	S. Agree	Agree
Heterogeneous view	Agree	NAD	Agree	S. Agree
Full autonomy preferences	15%-1%	75%-51%	75%-51%	75%-51%
IS oriented to effectiveness	S. Agree	Agree	Agree	Agree
IS oriented to autonomy	Agree	Agree	**Disagree**	Agree
Data shared	100%-76%	100%-76%	100%-76%	100%-76%
Data standardized	100%-76%	100%-76%	100%-76%	100%-76%
Decentralized IS expertise	NAD	Disagree	Disagree	S. Disagree
IS skills in host only	NAD	NAD	NAD	Disagree
H/W and S/W in host only	Disagree	NAD	NAD	S. Disagree
Reduce communication cost	NAD	Agree	NAD	Agree
Great pressure from host	NAD	NAD	S. Disagree	Disagree
Strict TBDF policy	S. Agree	NAD	**Disagree**	S. Agree
Unstable home	**Agree**	S. Disagree	Disagree	S. Disagree
Great foreign ownership	**75%-51%**	0%	0%	25%-1%
Different hosts environments	Agree	Agree	Agree	Agree
Decentralized computer systems	Agree	Disagree	NAD	Disagree

Keys: NAD = Neither Agree nor Disagree
S. Agree = Strongly Agree
S. Disagree = Strongly Disagree

with very short learning periods and so kept existing IS in place as globally disconnected systems. Only now, after a longer learning period, BODY is rethinking the whole IT strategy and attempting to align the MNISS structure with its global operational structure.

5. CONCLUSION

The results of the questionnaire, case studies and mini-cases are summarized in Table 7. The results suggest that of two theoretical concepts 'organizational fit' (Leifer 1988) and 'information sharing' (Lee and Leifer 1992) often used as a basis for alignment research only the latter gets empirical support. The results further strengthen the idea that companies will strive hard to achieve internal consistency to cope with the inconsistencies of the external environment. Internal consistency relates to the systems infrastructure and operational infrastructure implemented by corporation policies, standards and procedures.

The issues surrounding globalization are very complex and not necessarily well understood at the present time. More research of a truly international type is needed and several longitudinal studies would add significant richness to evolving theories. There is also a need to introduce more innovative theories for testing. Factors such as national culture, politics, size or importance of foreign markets, pattern or distribution of subsidiaries and nature of the customers may all be strong influencers on MNC structures and MNISS structures.

Table 7. Summary of the Supported Variables

	Supported Variables
Questionnaire Survey	— Degree of Data Sharing — Degree of Data Standardization — Degree of Difference of IS Maturity in Various Subsidiaries
Express Companies' Case Studies	— Degree of Foreign Ownership in Subsidiaries — Stability of the Home Country (Note: The three variables supported by the survey are in similar magnitudes in all four cases, so the comparison between these three variables are ignored in the case studies.)
Mini-Case Studies	— Degree of Data Sharing — Customer Profile — Role of IS in Companies — Internationalization Process (History of the Companies)

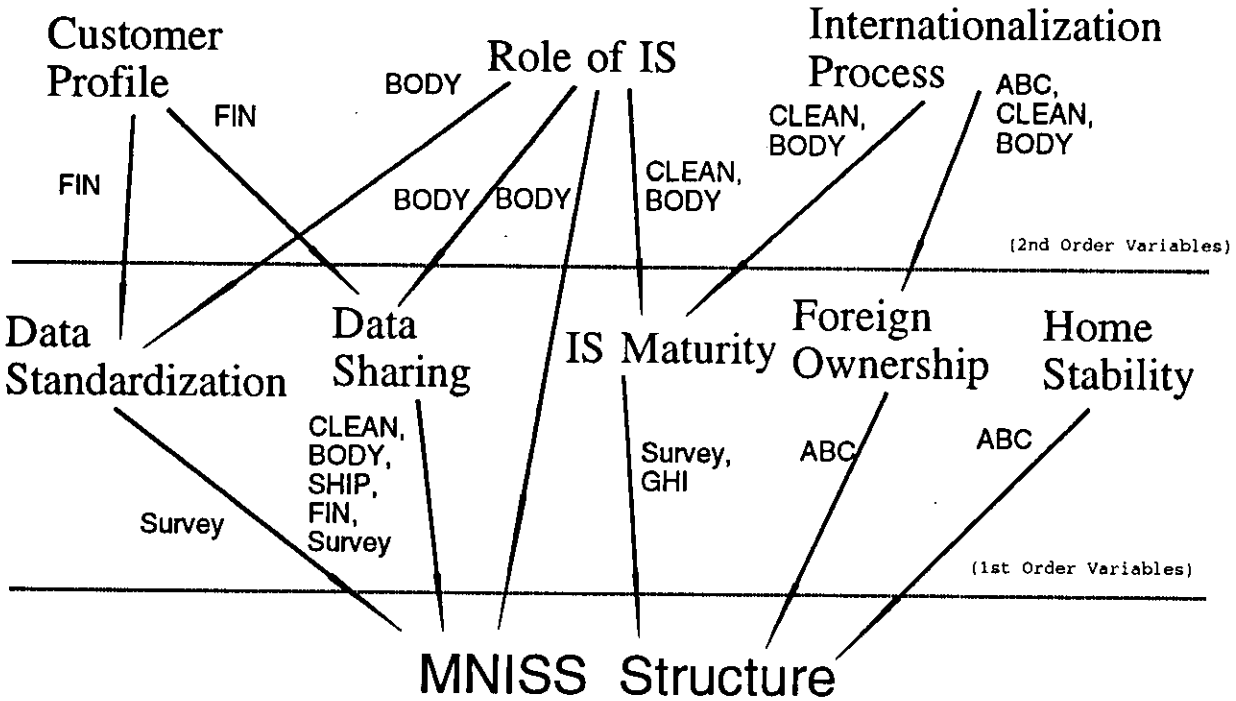

Figure 3. The Inter-relationships of the Factors

The findings from this study suggest several areas for further research testing and their perceived interrelationships are shown in Figure 3.

The variables are classified into three groups (National Politics, Internal Consistency and Company Strategy) according to their nature. However, the internationalization process variable can be grouped under both national politics and company strategy, as this process is both influenced by some host government's requirements (such as China, which only allows foreign companies to carry out their business in China in the form of joint ventures with local organizations) and the company's preference.

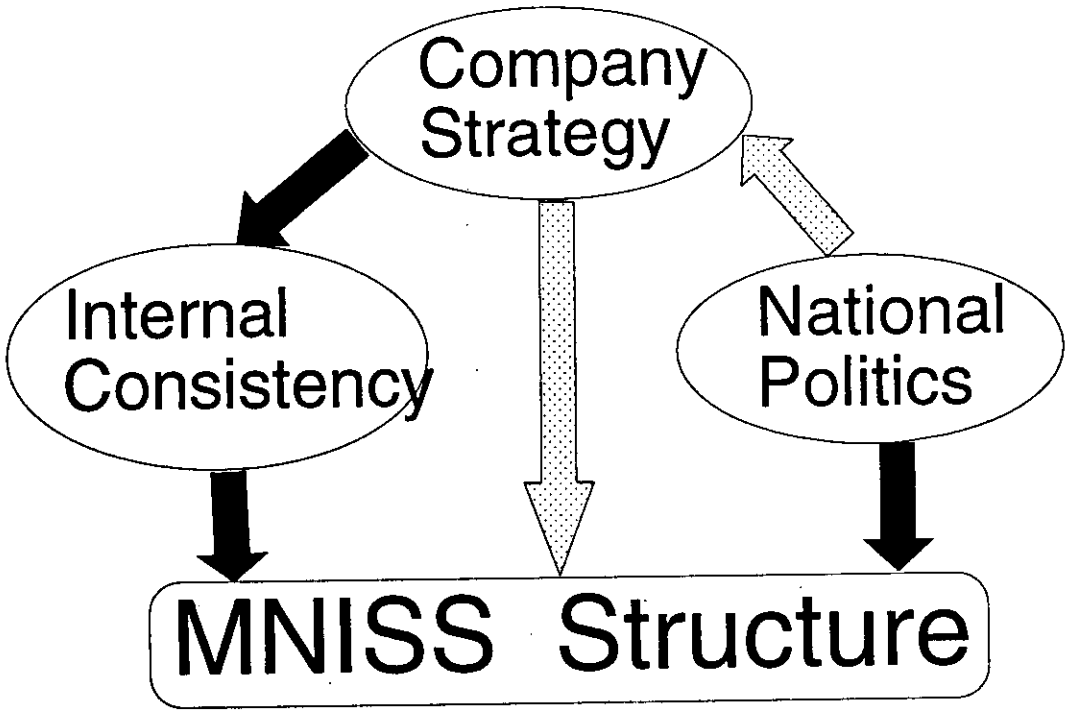

Figure 4. Simplified Contingency Diagram

The variables of internationalization process are divided into two parts and grouped under different categories. The groups of the variables are:

a) **National Politics**: Home Stability, Internationalization Process (host government's requirements);

b) **Internal Consistency**: Data Standardization, Data Sharing, IS Maturity, and Foreign Ownerships; and

c) **Company Strategy**: Customer Profile, Role of IS, and Internationalization Process (company's preference).

Figure 3 can be simplified into Figure 4, which shows that the company's internal consistency has definite and direct influences on the MNISS structure. The company strategy only has a moderate influence on MNISS structure directly, company strategy can strongly affect the company's internal consistency which can influence the MNISS structure, so it can argued that company strategy can either affect the MNISS structure through modifying the company's internal consistency or directly imposing structuring requirements on the MNISS. Finally, the national politics also have a clear and direct effect on the MNISS structure and a slight effect on the company strategy.

Unfortunately, the findings also suggest a large gap between theory and practice and raise doubts about the commonly accepted principle of business and IS alignment. Alignment may be critical to improve performance through IT but few of our respondents and interviewees consciously plan for this. This may be a direct result of living in a dynamic world or it may be that such dynamic organizational change is needed that organizations are still only partly evolved and will only make the quantum leap when the virtual organization is a virtual reality.

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