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DEVELOPING INFORMATION SYSTEMS IN A MULTI-CULTURAL ENVIRONMENT

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Abstract

Organizations are influenced by business forces towards globalization and the IT advancement which in itself creates opportunities for organizations to globalized their business. So, multinational companies (MNCs), characterized by having foreign affiliates, are increasingly emergent. These MNCs span a number of cultural environments with different requirements for IS, and to be successful, it is critical that a suitable multinational information system (MNIS) be installed. A federal IS structure is suggested as a suitable structure for MNIS, however, the degree of balance between the centralized portion and decentralized portion is still problematic. The authors propose a consensus approach in determining the minimum centralized portion of MNIS. This is based on the similarities between the psychological filters of the MNIS users, however, the authors also argue that the minimum centralized portion can be extended according to a number of regulating factors.

1 Introduction

Companies are subject to the influence of both business platforms and information technology/information systems (IT/IS) platforms [Senn, 1993]. Today, the business platform is being transformed by globalization of the marketplace [Deans, 1991] and the IT/IS platform is increasingly impacted by the advancement of micro-electronics technology. The interconnection between these platforms can create opportunity, value and impact [Senn, 1993] to companies.

For example, the ability of IS to overcome the distance barrier and reduce the time lag can be argued as one of the catalysts for the emergence of the global (international) marketplace [Deans, 1991; Deans & Kane, 1992; Roche, 1992], which has introduced keen global competition among companies. In order to survive in this rapidly evolving IS induced global marketplace, companies are forced to equip themselves to do business around the clock and around the world through the utilization of IS. Therefore, IS can also be viewed as a solution to address the issues of a global marketplace and to create new business opportunities. This leads to another competitive cycle between the dual influences of business globalization and IS advancement. Therefore, the authors argue that a properly managed IS development strategy is a major critical successful factor for companies operating in the globalized environment [Cash, et al., 1992].

Although, international business in a broad sense includes any business activity that crosses national borders, the term multinational company (MNC) is used to refer to

firms that have one or more foreign affiliates and is therefore involved in cross-cultural management. A firm may be involved in international business through exporting or importing and not be recognized as a MNC [Cheung & Burn, 1994]. In this paper, therefore, concentration will be on cross-cultural issues from the perspective of the MNCs who face unique problems, challenges and opportunities not necessarily encountered by domestic firms. Managing the IS in this multi-cultural context is a difficult task and one that deserves considerable attention. So, in this paper, discussion will focus on the issues related to the successful development of multinational IS (MNIS) in MNCs.

In the remainder of this paper, the following aspects will be addressed : the economic and political imperatives of MNCs; international business strategies; psychological filter of IS; multiple psychological filters of MNIS; and a proposed approach for MNIS design.

2 Multinational Companies

2.1 Economic Imperatives Against Political Imperatives

Business globalization is a business initiative based on the conviction that the world is becoming more homogenous, so companies have opportunities and influences extending well beyond national or country boundaries in such a way that products can be 'world products' [Senn, 1993]. Roche (1992) argues that changes in most of the world's economy towards a globalized environment have forced companies to adapt to stronger international competition by developing a more coherent international strategy. The formulated international strategy is usually based on the tradeoff (or balance) between the conflicting economic and political imperatives of a MNC's operations [Doz, 1980; Prahalad & Doz, 1981].

On one hand, the economic imperative forces companies to perform global economic integration of their operations [Contractor & Narayanan, 1990; Doz & Prahalad, 1984; Ghoshal & Nohria, 1993] to cut costs and realize efficiencies by reducing the differences in models of a product sold in different nations [Contractor & Narayanan, 1990]. On the other hand, the political imperative pushes companies to enhance the national political responsiveness in their operations to introduce variations, from one country to another, in product design, after-sales service and other technical parameters in order to suit local customers and governments better.

Because different companies face different environments

(both internal and external), companies will experience different strengths of pressure exerted by these imperatives. These variations of strength of the imperatives cause companies to have different degrees (attitudes) of international commitment, centralized control and decentralized autonomy. The different combination of these attitudes affects the adoption of different international strategies by the companies. This is reviewed in the next section.

2.2 International Strategies

There are a number of classification schemes related to international strategies employing many different criteria. For example, White and Poynter (1984) classify the international strategies according to the product scope, market scope and value-added scope : *marketing satellite* as subsidiaries sell products which are manufactured centrally into the local trading area; *miniature replica* as subsidiaries produce and market some of the parent's product lines or related product lines in the local country; *rationalized manufacturer* as subsidiaries produce a particular set of component parts or products for a multi-country or global market; *product specialists* as subsidiaries develop, produce and market a limited product line for global markets; and *strategic independent* as subsidiaries are permitted independence to develop lines of business for either a local, multi-country or global market.

An alternative view is provided by Perlmutter (1984), who has developed a simplified behavioural classification that comes closer to addressing the subsidiary problem and is based on the level of commitment for doing business internationally. Under this classification, there are four international orientations : *ethnocentrism*; *polycentrism*; *regiocentrism*; and *geocentrism*.

Among the four orientations, ethnocentrism is the lowest level of commitment for international business. The objective of ethnocentrism is just to dispose of excess goods, it requires the acceptance of home country values and standards throughout the multinational, which implies centralized control and very limited notice taken of the views of host country managers [Higgins, et al., 1991; Taggart, 1992].

In polycentrism, corporate headquarters accept that local managers know what is the best for each country/subsidiary, and business programmes in each subsidiary are designed independently to match the needs and culture of an individual country; thus, subsidiaries become as localized in identity and behaviour as possible.

For regiocentrism and geocentrism, both involve collaboration between the subsidiary and headquarter to establish broad and universal standards with an acceptable degree of local variation on the basis of which decisions are being taken. However, in regiocentrism, business programmes are designed to match needs in areas that may have similarities that transcend national boundaries; whereas

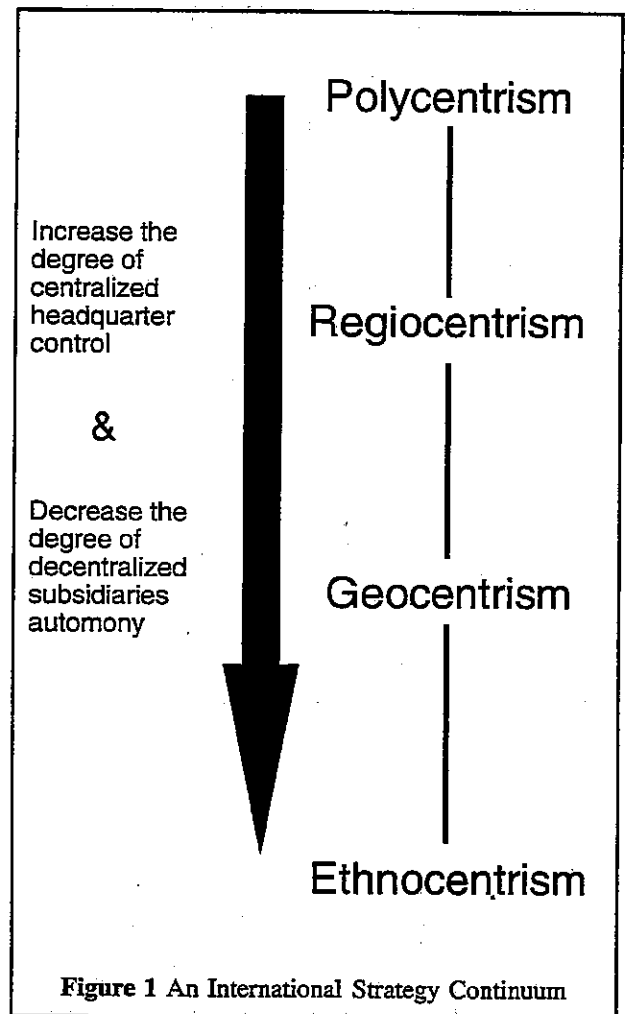
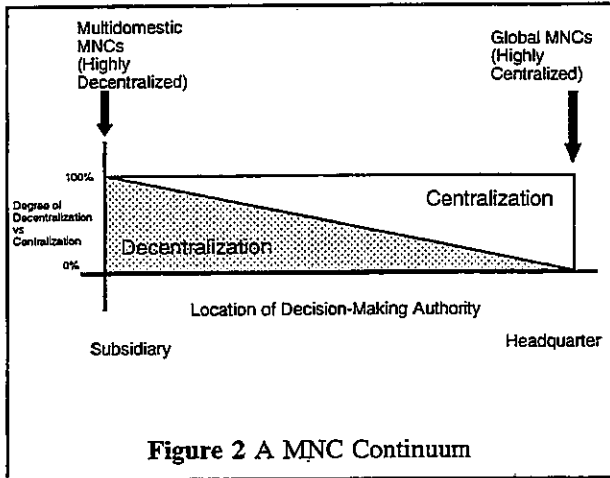


Figure 1 An International Strategy Continuum

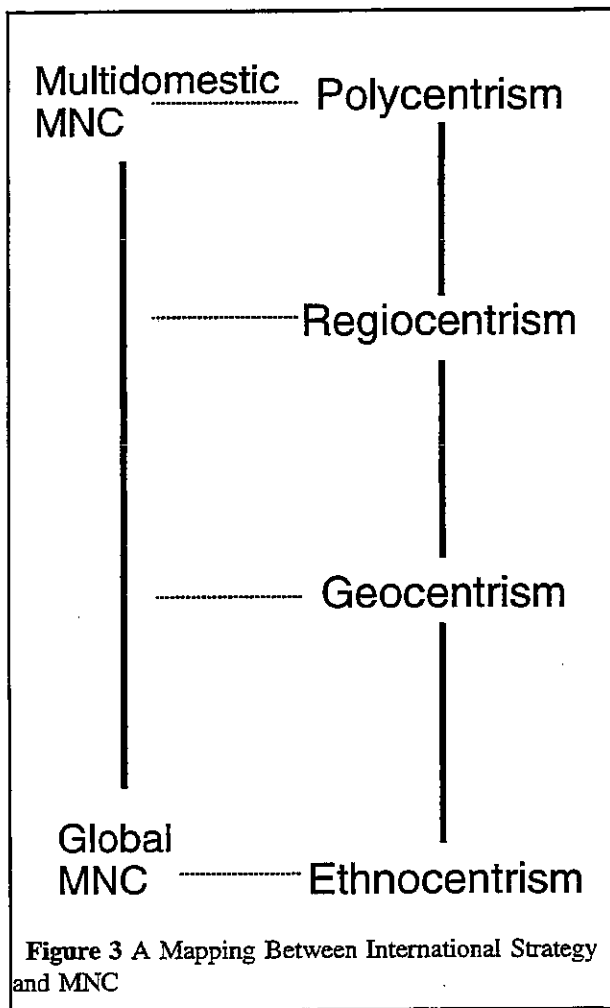
in geocentrism, business programmes are designed on the basis of the perception that the world represents one large market.

An international strategy continuum, as shown in FIGURE 1, can be formed for these four strategic orientations based on the degree of centralized headquarter control and the degree of decentralized subsidiaries autonomy. The authors have argued that the adoption of different international strategies by MNCs is one of the factors causing differences in the types of MNC [Cheung & Burn, 1994]. Before, further discussion of the relationships between the types of MNC and the international strategies which they adopt, a MNC continuum is introduced.

A MNC continuum, classifying MNC into different types, has been proposed with *global MNC* and *multidomestic MNC* as the extremes [Cheung & Burn, 1994] and is shown in FIGURE 2. The multidomestic MNCs view the world as a composition of a number of different domestic markets, therefore they will delegate / decentralize all the decision making authority to their subsidiaries, which can be regarded as fully autonomous units. The global MNCs view the world as a single market, therefore they attempt to control all the subsidiaries as a



single entity and ignore the differences contingent to each subsidiaries' markets, consequently, the decision making authority is centralized in the headquarters.



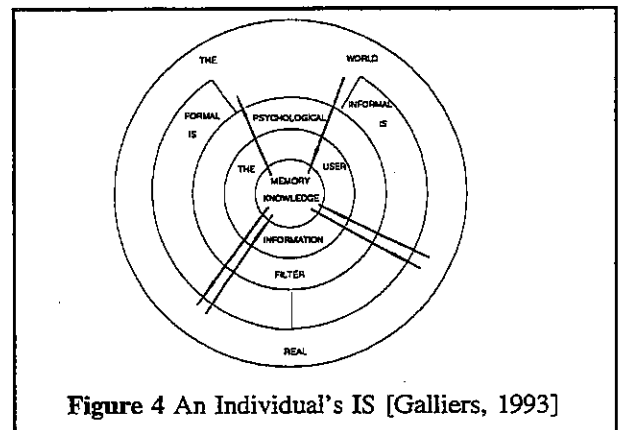
The authors contest that according to the basic philosophy applied in the business, the extreme of ethnocentric strategy in the international strategy continuum can be mapped with the extreme of global MNC in the MNC continuum [Cheung & Burn, 1994], whereas, the polycentric strategy can also be mapped with the multidomestic MNC as shows in FIGURE 3. Given that different types of MNC should have different IS requirements, the design and implementation of MNIS becomes a highly complicated task. In the following sections, the development of MNIS will be discussed.

3 Multinational Information Systems

A MNIS is defined as an IS which is operated or managed across two or more national borders, so that it has to deal with a heterogenic national environment. The authors further argue that the heterogenic national environment forces IS to interface with multiple national cultural environments, which causes a major difficulty in designing the MNIS. In this section, a consideration will be given to the national effects on IS.

3.1 Psychological Filter of IS

Galliers (1993) introduces a model of an individual's IS to support individual informed activity / decision making as shown in FIGURE 4. As, the major focus of this paper is on the formal IS, so, the informal IS of Galliers' model will be ignored in the following discussion.



Galliers' model shows that an individual, as an information user, is using IS as part of his/her interface to interact with the real world, and the psychological filter of the information user affects his/her interpretation (or perception) of data (or events) from the real world. It is argued that the psychological filter is influenced by a number of factors, such as education, experience and national culture. Due to the differences in these factors, there exists variations in the different psychological filters of information users, such that different information users

will perceive the real world differently. Furthermore, in the centre of Galliers' model, memory knowledge of the information user acts as the mechanism to retain all the individual (the scope of individual IS) learning of the real world.

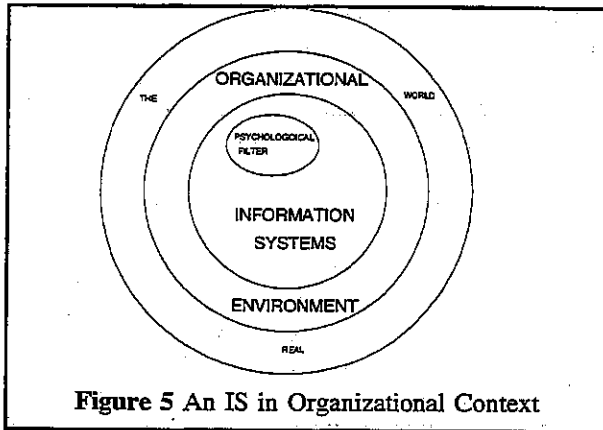


Figure 5 An IS in Organizational Context

Nevertheless, in designing IS for organizations, it is important to consider IS within the organizational context. The authors argue that individual memory is no longer an effective mechanism to maintain the learning of the whole organization (the scope of organizational IS) of the external world. From the literature of organizational learning [Fiol & Lyles, 1985; Hedberg, 1981; Stata, 1989], it is suggested that organizations memorize their learning by ways of institutional mechanisms, such as policies, procedures, and organizational structures. However, the authors argue that the information users, policies, procedures and organizational structures (that is organizational memory mechanisms) are also components of IS [Cheung & Burn, 1995a], so FIGURE 4 can be modified into FIGURE 5 which argues that the psychological filters of the information users is part of the organizational IS.

In FIGURE 5, it is assumed that the organizational IS encounters a homogeneous external environment and deals with the market in one domestic area only, such that information users are confronting the same national culture, argued to be a major influencer for the psychological filters of information users. Therefore, it is also reasonable to assume that only one psychological filter exists for one organizational IS. The deviations for the psychological filters of the information users caused by the differences in education and experiences are already accounted for in the organizational memory mechanisms but do not consider the impact of national culture on the psychological filter.

3.2 Multiple Psychological Filters of MNIS

For MNIS, as in FIGURE 6, faced with a multinational environment (that is a heterogeneous environment), different groups of information users in different domestic areas will be confronted with different national cultures which forces

different groups of users to adopt different psychological filters in interpreting the external real world. Therefore, the MNIS has to cope with several psychological filters simultaneously, which causes difficulties in designing and implementing MNIS. As a result, it is important for IS designers to be aware of the multiple psychological requirements (filters) of MNIS in advance in order to have a successful implementation of MNIS.

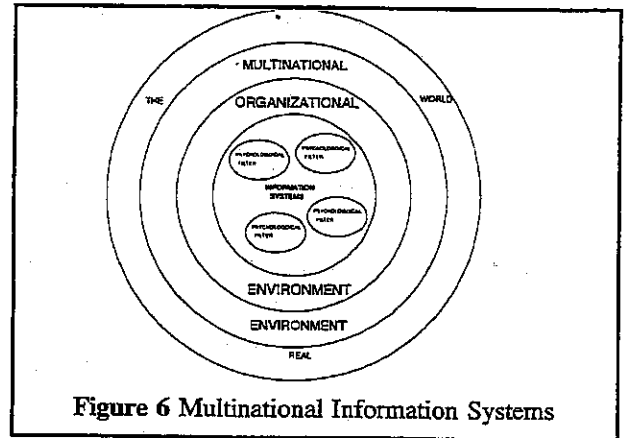


Figure 6 Multinational Information Systems

In order to cope with the multiple psychological requirements, in other words the different local requirements of the subsidiaries in MNC, a distributed structure of IS is suggested to be [Cheung & Burn, 1995b] a solution. Under the distributed structure, part of the IS activities should be centralized into the headquarters to increase the corporate-wide efficiency and part of the IS activities should be decentralized into the subsidiaries to increase the subsidiaries effectiveness. However, the balance between centralization and decentralization remains the major problem for the MNIS designer. In the next section, the authors propose a consensus approach in tackling the problem of centralization and decentralization.

3.3 MNIS Design

The authors argue that although information users use different psychological filters to interpret objects or events, there should be a certain degree of similarity between their interpretations if they are focusing on the same object. Since the nature of the object will not be distorted by the psychological filters, it is only the characteristics of the object that are enhanced or depressed by the psychological filters.

For example, to represent the number "forty thousands" in numeric format, it is written as 40,000 in British culture (psychological filters), but it is written as 4,0000 in Chinese culture (psychological filters). Moreover, in some European cultures, a dot '.' is used instead of using a comma ',' as a separator. This example, shows that there are both similarities and differences in the description of the same object from different psychological filters, as no matter the

culture, five digits are used to represent "forty thousands".

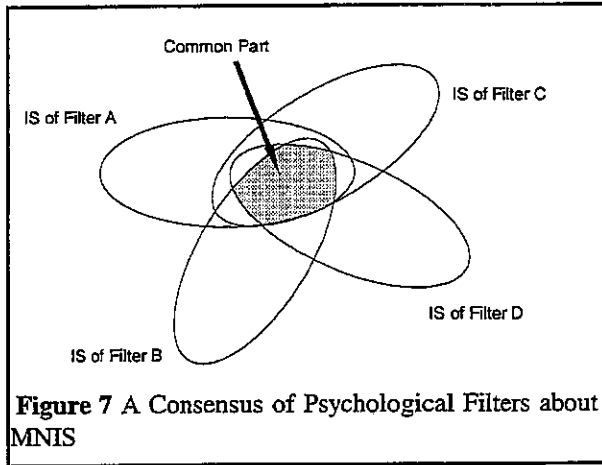


Figure 7 A Consensus of Psychological Filters about MNIS

The authors propose that it is useful to describe the MNIS from different psychological filters in order to find the common part of all these descriptions. In FIGURE 7, each ellipse represents the description of the MNIS from an individual psychological filter and the overlapping area of all of these ellipses, that is the shaded region, represents the common part of all of these descriptions. The authors contend that the common part of the descriptions of the MNIS should be implemented in centralized style at headquarter to reduce the cost of duplication, but the individual (uncommon) part should be implemented at the particular subsidiary offices respectively.

It is suggested that multidomestic MNC should have a larger degree of variations in its psychological filters, so that a lower degree of overlapping of its psychological filters will result, however, global MNC should have a much larger degree of psychological filters overlapping as the variations of psychological filters should be smaller in the case of global MNC.

However, from FIGURE 7, there are still some regions which are outside the shaded area but are overlapped by two or more, but not all, ellipses (psychological descriptions). The decision on centralization or decentralization of these regional descriptions is quite problematic. Since, on one hand, the centralized portion of MNIS can be extended into these regions to enhance central control, but, on the other hand, the decentralized portion of MNIS can also be extended to allow these regions to increase local autonomy of the subsidiaries. The authors argue that the centralization and decentralization of these problematic portions of MNIS should be regulated by a number of factors, such as decision making style in the MNC, business competitive strategy adopted by the MNC and so on. Therefore, a research project has been proposed and initiated by the authors to investigate these regulating factors [Cheung & Burn, 1995b] in order to help the MNIS designers and MNC managers to configure their MNIS to more easily encounter the challenge of globalization.

In the study of the regulating factors, an IS management

research framework is developed as shown in FIGURE 8 [Cheung & Burn, 1995a]. The research framework, is based on an argument that IS are composed of five groups of elements as people, data, computer systems, organizational structure, policies and procedures, which exists within an organizational environment. Among the variables of organizational environment, IS are directly related to systems owner, organizational context and purposeful action (systems goal). Hence, the authors argue that IS management can be interpreted as the coordination and integration of the IS related elements (that is the five groups of IS elements and the three environmental variables) to facilitate the IS to achieve their predefined goals.

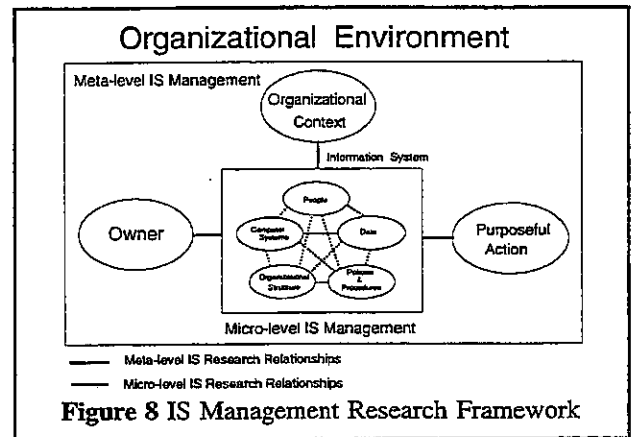


Figure 8 IS Management Research Framework

According to the proposed research framework, the authors [Cheung & Burn, 1995b] have developed a set of regulating factors for a) organizational context : decision making style of the corporation; corporate business competitive strategy; level of international involvement of the corporation; degree of product interchangeability between the local affiliate and the rest of the corporation; and degree of differences in the level of IS maturity among the corporation, b) system owner : management's business philosophy; and management's world view, c) system goal : general orientations of IS; and focus of IS, d) data : degree of data sharing among corporation; and corporate data management focus, e) people : location of expertise in the corporation; availability of IS professionals around the countries; and cost of skilled IS people, f) organizational structure, g) computer systems : processing requirements of the corporation; required security versus reliability of the IS; availability of hardware and software; and cost of hardware and software, h) organizational environment : pressure from the governments; countries stability; outside ownership and degree of different among host countries environment. TABLE 1 summarizes the implied effect of these factors on MNIS development.

4 Questionnaire survey

4.1 Operations

Based on the proposed regulating factors (see TABLE 1) discussed above, a questionnaire mailing survey was carried out by the end of May, 1994 to one thousand companies randomly sampled from a list. The list of companies was compiled using a number of references [Corr, 1993; Dun & Bradstreet, 1990; Hong Kong Telecommunication (1993); Lau, 1993; Stopford, 1992]. At the end of August, 1994, seventy-five fully completed valid questionnaires were returned from MNCs, two partially completed invalid questionnaires returned. Therefore, the total valid response rate is 7.5%.

The locations of the headquarters of the returned samples shows the following distributions : USA (37.8%), Hong Kong (HK) (21.3%), Japan (13.3%) and United Kingdom (UK) (10.7%) make up the majority of the total sampled.

The variables were analyzed separately from three dimensions : systems development, systems management and systems operations. For each variable and each of these three dependent variables, data was analyzed through three stages : (a) contingency table test, to identify visual clustering among the two testing variables; (b) chi-square (χ^2) test, for testing the association between two variables; (c) spearman's rank correlation coefficient (r_s) test, for analyzing the increasing or decreasing relationship between the two variables. The results of the statistical testings are presented in TABLE 2. In the following section, the results of the questionnaire survey will be discussed.

4.2 Discussions

Generally, the results of the questionnaire survey shows that most of the variables, which have been proposed in the current literature regarding the MNIS development, are not proved to be not supported in the current situations. Furthermore, some interesting phenomena were found from the survey results.

Among the proposed 24 variables, only three of them are shown to be related to the MNIS structuring. 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 the IS stages in various MNC groups.

It can be argued that the issue of MNIS structure is viewed from a technical focus rather than a social focus in current practice, as MNC management does not seriously consider the organizational dimension of the IS. This focus may be the result of the complexity in dealing with local organizational and social issues on a worldwide scale, so MNC management may find it easier to relate solely to the technical issues.

Because of the dynamics of the new global environment,

some of the variables proposed in the literature in the past may not be considered relevant to the MNIS centralization / decentralization issue today.

Firstly, the improvement in education system in various countries causes the availability of IS expertise and IS skills in different countries to be less relevant in considering the MNIS structuring.

Nowadays, countries' competition tends to be based on high-technology, to improve the countries' competitive ability, it is important for the countries to enhance their citizens' education level to become familiar with competition battle-field, that is high-technology competition. As IS is a playground for utilization of high-technology, IS education in countries have been a greatly improved and so, the availability of IS expertise and IS skills in various countries are becoming more equivalent and evenly distributed. Therefore, the issue of centralization or decentralization of IS expertise or skills actually does not exist. Therefore, the availability of IS expertise and skills, in any case, may also be resolved in quite a different manner through outsourcing.

Secondly, a reduction in inter-national protectionism to promote worldwide economic growth lessens the pressure from host governments, and strictness of transborder data flow (TBDF) policies regarding availability of required hardware and software. This is also now much less relevant in designing the structure of MNIS.

Due to the worldwide recession over the past years, countries have had to attract foreign investments in their territories, so they have had to loosen some of the policies or regulations in favour for the foreign investments. Under these circumstances, governments will exert lesser pressure and control over the daily operations of the MNCs, such as elimination of the TBDF policies and de-regulating the previously protected or monopolized industries.

Furthermore, with exceptions to only a number of countries (such as Iran). Equal and open trade is the main driver for inter-national business practices, therefore, the availability of hardware and software is not a problem to MNC as they can transfer the essential resources freely around the world without too much restrictions from the countries 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 MNIS structures.

5 Conclusion and Summary

The interaction of business globalization and the advancement of IT creates opportunities for organizations to extend their business across national borders. As a result, MNCs are an increasingly emergent phenomena in the business world. The creation of MNCs also emphasizes on the needs in cross cultural management and cross cultural information requirements.

So, for the success of MNCs, it is important to have an efficient and effective MNIS installed in order to satisfy the multiple information requirements in MNC. A federal structure of IS is suggested to be the most suitable structure for MNIS. Under this structure, the IS function of a MNC is divided into two parts, centralized portion and decentralized portion, and IS resources are distributed among these portions. However, the degree of balance between the centralized portion and decentralized portion is a more complex problem for MNIS designers.

The authors suggest a consensus approach to determine the centralized portion of MNIS, based on identifying the similarities and differences between the cultural psychological filters of the information users of MNIS. The authors further argue that the centralized portion can be extended according to a number of regulating factors. Finally, a list of regulated factors under the eight headings (organizational context, system owner, system goal, data, people, organizational structure, computer systems, and organizational environment) is identified and research is proposed by the authors to carry out the investigation on these regulating factors. The preliminary results of a questionnaire survey shows that only three proposed factors seem to be relevant to the issue. The factors 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 the IS stages in various MNC groups.

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	Pressures to Centralize	Pressures to Decentralize
Organizational Context		
Decision Making Style	Central	Decentral
Business Competitive Strategy	Global	Multidomestic
Level of International Involvement	Low	High
Degree of Product Interchangeability Between the Local Affiliate and the Rest of the Multinational Groups	High	Low
Degree of Differences in the level of IS Maturity Among the 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
Cost of Skilled Labour	Lower in Headquarters	Lower in Subsidiaries
Organizational Structure		
Organizational Structure	Global	Multidomestic
Computer Systems		
Security versus Reliability	Security Maintenance	Reliability main Concern
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 of Hardware and Software	Lower in Headquarters	Lower in Subsidiaries
Others	Making Large-scale Processing Capacity Available	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 Different Among Host Countries Environment (e.g. social value and language)	Low	High

Table 1 Pressures for IS Centralization vs Pressures for IS Decentralization

	Decentralized Systems development	Decentralized Systems management	Decentralized Systems operation
Decentralized management	visually support	not support	visually support
Multidomestic strategy	fairly 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
Heterogeneous view	not support	not support	not support
Full autonomy preferences	visually support	not support	visually support
IS oriented to effectiveness	not support	not support	visually support
IS oriented to autonomy	not support	not support	not support
Low data sharing	strongly support	statistically support	fairly support
Low data standardization	strongly support	statistically support	fairly support
Decentralized IS expertise	not support	not support	not support
IS skills in host only	not support	not support	not support
IS personnel cheaper in host	visually support	not support	visually support
Multidomestic structure	not support	not support	not support
Systems design focus on reliability	visually support	not support	visually support
HW and S/W in host only	not support	not support	not support
HW and S/W cheaper in host	not support	slightly support	not support
Reduce communication cost	not support	not support	not support
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

Table 2 Statistical Summary of the Variables