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Does Environment Matter? An Empirical Investigation Of IS Strategy And Structure In Multinational Corporations

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Abstract

This paper reports the results of an empirical study that examines the influence of environment complexity and levels of IS resources on the IS strategy and structure developed for subsidiaries of multinational corporations. Results suggest that, while the levels of subsidiary IS resources clearly influence the IS strategy and structure for the subsidiary, the levels of environment complexity faced by the subsidiary do not. Results also suggest that IS structural mechanisms are not associated with the IS technology and activities in place at the subsidiary.

Introduction And Underlying Theory

Managers in subsidiaries of multinational corporations (MNCs) face the two opposing forces of *global integration* and *local responsiveness* (Bartlett and Ghoshal 1989). The force of global integration comes from the MNC need to achieve efficiency in a global scale. In order to compete, the MNC operations must standardize and coordinate managerial and technological practices developed by the corporate headquarters. The subsidiary of a MNC located in a foreign country also poses a set of pressures that are usually inconsistent with the internal pressures of global integration. The subsidiary must attend and be responsive to the national interests and preferences.

This study explores the subsidiary managerial response to internal and external pressures of standardization and coordination by focusing on the mixed motivations of the subsidiary manager, which are delineated by the context where the subsidiary operates (Prahalad and Doz 1987). Based on the study of Ghoshal and Nohria (1989), it is argued that the managerial response will be contingent on two contextual factors: (a) the complexities and uncertainties involved in the operation of the subsidiary, and (b) the subsidiary's ability of carrying independent operations.

The uncertainties and complexities of the subsidiary's technical environment (the external actors that have a direct influence on the efficiency of the subsidiary operations - local suppliers, consumers, competitors, etc.) have a positive impact on the subsidiary's motivation to interact with the corporate headquarters. Because the corporate headquarters deals with operations in several countries, it ends up having greater knowledge and experience with these types of uncertainties and becomes a valuable source of information for the subsidiary. This creates an interest on the part of the

subsidiary manager to initiate a cooperative relationship with the headquarters, in order to make the subsidiary's operations more predictable and efficient.

Similarly, if the subsidiary is dependent on headquarters resources such as capital, technology, human resources, access to markets, etc. to operate, it will have no option but to engage in a cooperative relationship. However, if the subsidiary is self-sufficient, its motivation to interact is reduced since the resources necessary to maintain the operations are available elsewhere. Thus, the subsidiary ends up more involved with the national interests of the host country, which usually becomes the primary source of resources for the subsidiary.

Using this underlying principle of mixed motives, this study explores how the information systems (IS) manager responds to different levels of the two above mentioned contextual factors - *environmental complexity* and *levels of IS resources* available to the subsidiary. ***Environment complexity*** captures the levels of imperfect knowledge (uncertainty) and fluctuations in the subsidiary operations. ***Subsidiary IS resources*** are the available information and communication technologies, IS personnel, access to hardware and software markets, etc. that guarantee the subsidiary IS operations. The following logic, regarding the influence of environment complexity and subsidiary IS resources, will guide our hypotheses in this study:

- Environment complexity increases the subsidiary motivation to interact with the corporate headquarters, making them more interdependent. This more cooperative and reciprocal relationship should therefore be expected and reflected in the organization of the information systems function.
- An increased level of subsidiary IS resources allows the subsidiary to pursue interests that might be independent and divergent from those of the corporate headquarters. This increased level of subsidiary autonomy should therefore affect the way the subsidiary IS function is organized.

Research Design

Exogenous Variables: This study tests the effect of two exogenous variables:

- *Environment complexity* (ENVCOM) refers to the relevant charty of technical and human resources to support IS operations.

Endogenous Variables: The decisions of IS managers with respect to the organization of the IS function can be reflected in both the subsidiary IS structure and IS strategy. The subsidiary IS structure refers to the way in which the decision making process and the interactions between the IS personnel in the headquarters and the subsidiary take place. It can be characterized by:

- *Centralization* (CENTRAL) refers to the hierarchical governance mechanism that exists between the headquarters and subsidiary IS groups regarding the decision making process;

- *Formalization* (FORMAL) is interpreted as the routinization of decision making process or the extent to which the interaction between the units is structured by the means of rules, standard procedures, etc.;
- *Socialization* (SOCIAL) is the extent to which goals, objectives, and values are shared between the subsidiary and the corporate headquarters.

The subsidiary IS strategy is the set of technologies and activities developed by the IS group to support the processing and distribution of information between the subsidiary and headquarters. The most relevant aspects of the IS strategy are captured by the technology in use and the planning activities conducted by the IS group:

- *Technology* (ISTECH) refers to all physical IS components. This includes the way in which the databases are organized, located, and accessed, the extent to which telecommunication technologies are used, the source of IS technology (whether the technology is developed and/or purchased), and the levels of standardization in the IS technology;
- *Planning* (ISPLAN) defines the overall direction and objectives of the subsidiary IS activities. Relevant aspects include the extent to which the subsidiary's needs are included in the IS planning for the subsidiary, the level of subsidiary interaction with headquarters during IS planning for the subsidiary and the MNC as a whole, and the level of subsidiary influence in the IS planning for the whole MNC.

Hypotheses: It is hypothesized that the levels of environment complexity and IS resources affect the way the subsidiary IS are arranged (IS technology and planning) and managed (centralization, formalization, and socialization in the IS function). It is also hypothesized that the technology and planning elements of the IS strategy have an influence on the way the IS function is managed. This comes from the fact that an organization's management system should be developed to support the competitive strategy developed by the organization.

Research Model: Pictorially described on Figure 1.

System of Equations: The following system of equations is derived from the above hypotheses and research model.

$$\begin{cases} \text{CENTRAL} = \alpha_0 + \alpha_1 \times \text{ISTECH} + \alpha_2 \times \text{ISPLAN} \\ \text{FORMAL} = \beta_0 + \beta_1 \times \text{ISTECH} + \beta_2 \times \text{ISPLAN} \\ \text{SOCIAL} = \gamma_0 + \gamma_1 \times \text{ISTECH} + \gamma_2 \times \text{ISPLAN} \\ \text{ISTECH} = \lambda_0 + \lambda_1 \times \text{ERES} + \lambda_2 \times \text{ENVCOM} \\ \text{ISPLAN} = \delta_0 + \delta_1 \times \text{ERES} + \delta_2 \times \text{ENVCOM} \end{cases}$$

Measurement: Factors were measured through several questionnaire items. The unit of measurement was Likert type scales, varying from 1 to 5.

Units of Observation and Data Source: The units of observation for this study are the subsidiaries of MNCs. A mail questionnaire survey was sent to corporate chief information officers (CIOs) of 100 US MNCs with subsidiaries in Canada and Mexico.

The CIOs were asked to evaluate both subsidiaries along the dimensions presented in the table on next page. We received 31 responses, from which 21 were completed questionnaires, leading to a response rate of 21%. Two respondents only provided information about one of the subsidiaries. Therefore, data was available on 40 subsidiaries.

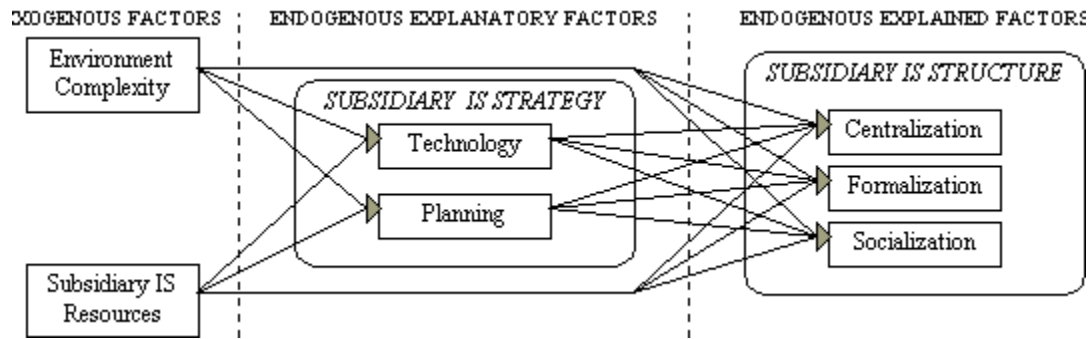


Figure 1 - Research Model
Results

Factor Analysis was performed to assess the reliability and validity of the questionnaire items. The results of the factor analysis with varimax rotation were used to eliminate questionnaire items that were poorly related to the constructs.

The effect of the two exogenous factors on the endogenous factors was initially estimated through multiple regression analysis. The factors were computed by adding the scores of the items associated with the factor. These initial equations represent the reduced form of the system of equations previously presented. We then computed the coefficients for the system of equations. The reduced form system of equations was used to compute the estimated values of ISTECH and ISPLAN. These values were then input in the equations where ISTECH and ISPLAN are explanatory variables. The results are presented below (***: $\alpha = 0.01$, **: $\alpha = 0.05$, * : $\alpha = 0.10$):

Initial Regressions (reduced form)

$$\begin{aligned} \text{CENTRAL} &= 5.64 - 0.20 \times \text{ISRES} + 0.21 \times \text{ENVCOM} \\ \text{FORMAL} &= 2.69 + 0.70^{***} \times \text{ISRES} + 0.16 \times \text{ENVCOM} \\ \text{SOCIAL} &= 1.93 + 0.64^{***} \times \text{ISRES} + 0.33 \times \text{ENVCOM} \\ \text{ISTECH} &= 3.96 + 0.87^{***} \times \text{ISRES} - 0.13 \times \text{ENVCOM} \\ \text{ISPLAN} &= 3.81 + 0.39^{**} \times \text{ISRES} + 0.19 \times \text{ENVCOM} \end{aligned}$$

Final Regressions (system of equations)

$$\begin{cases} \text{CENTRAL} = 1.30 - 1.18 \times \text{ISTECH} + 0.81 \times \text{ISPLAN} \\ \text{FORMAL} = -0.65 + 0.65 \times \text{ISTECH} + 1.08 \times \text{ISPLAN} \\ \text{SOCIAL} = -1.15 - 0.07 \times \text{ISTECH} + 1.85 \times \text{ISPLAN}^* \\ \text{ISTECH} = 1.59 + 3.63 \times \text{ISRES}^{***} - 0.42 \times \text{ENVCOM} \\ \text{ISPLAN} = 1.98 + 2.07 \times \text{ISRES}^{**} + 0.81 \times \text{ENVCOM} \end{cases}$$

Discussion And Managerial Implications

The results show that the levels of subsidiary IS Resources clearly influence the subsidiary IS strategy and structure. The technology and planning activities are more centered towards the subsidiary needs when the subsidiary is not dependent on the

headquarters for IS resources. Similarly, the management system (or structure in practice) becomes more formal and the use of socialization practices becomes necessary for the interaction between the subsidiary and headquarters IS groups. However, the level of IS resources does not affect the level of centralization in the subsidiary-headquarters IS group relationship.

The results do not support the hypotheses linking the levels of complexity in the environment to the subsidiary IS strategy and structure. None of the endogenous factors was affected by environment complexity. Further understanding of the external factors influencing the IS infrastructure is necessary.

The system of equations do not support the idea that the subsidiary IS strategy influences the IS structure. This tells us that IS managers in multinational corporations do not associate the management mechanisms with the information systems technology and activities. In other words, while there seems to be internal consistency in the IS structure, the same does not happen for the IS strategy, which becomes more differentiated when the levels of subsidiary IS resources increases.

The implications to be taken from this study are that managerial coordination over the subsidiary IS operations can be achieved by structuring the relationship between the subsidiary and the corporate headquarters IS groups. This, however, does not prevent the subsidiary from pursuing its independent goals and differentiating its IS activities and technologies. In other words, the balance between integration and differentiation is achieved by integrating the IS structure and differentiating the subsidiary IS strategy.

References

References available from the first author upon request.