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EXPLORING THE UNCHARTED LINKAGE BETWEEN

GLOBAL INTEGRATION AND INFORMATION TECHNOLOGY:

A CONCEPTUAL MODEL AND AN EMPIRICAL INVESTIGATION

by

Paulo Roberto Flor

BS, Mechanical Engineering, Federal University of Minas Gerais, 1988

MS, Aerospace Engineering, Georgia Institute of Technology, 1990

Submitted to the Graduate Faculty of

the Joseph M. Katz Graduate School of Business in partial fulfillment

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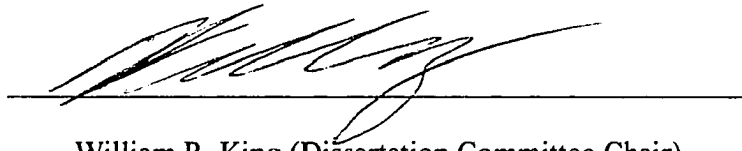Ann Arbor, MI 48103

Dissertation Committee

William R. King (Dissertation Committee Chair)

University Professor

Joseph M. Katz Graduate School of Business, University of Pittsburgh

Andrew R. Blair

Professor of Business Administration and Economics

Joseph M. Katz Graduate School of Business, University of Pittsburgh

Hector Correa

Professor of Public and International Affairs

Graduate School of Public and International Affairs, University of Pittsburgh

Laurie J. Kirsch

Associate Professor of Business Administration

Joseph M. Katz Graduate School of Business, University of Pittsburgh

Mona V. Makhija

Assistant Professor of Business Administration

Joseph M. Katz Graduate School of Business, University of Pittsburgh

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EXPLORING THE UNCHARTED LINKAGE BETWEEN
GLOBAL INTEGRATION AND INFORMATION TECHNOLOGY:
A CONCEPTUAL MODEL AND AN EMPIRICAL INVESTIGATION

Paulo R. Flor, Ph.D.

University of Pittsburgh, 1999

Several recent conceptualizations of global business management suggest the emergence of multinational corporations (MNCs) that operate integrated, as a single worldwide entity. Supporting and enabling this trend has been the advent of information technology (IT). Previous research linking business and IT strategies for the MNC have been unable to fully explicate this relationship, leaving unanswered questions as to what drives the development of the IT infrastructure within the MNC.

This dissertation proposes a model predicting the capabilities of the IT and organizational infrastructures of a MNC based on its levels of global interdependence and global correspondence. It is hypothesized that the strategic orientation adopted by the MNC in face of distinct industry globalization conditions has consequences to the levels of global interdependence which, together with the levels of global correspondence or agreement among national units, shape the global IT and organizational infrastructures of the MNC.

The empirical study uses a cross-sectional, mail survey methodology. A sample of US MNCs in the manufacturing sector was used. Two instruments were developed to measure for each MNC the globalization potential of the industry, its strategic

orientation, levels of global interdependence and correspondence, and the capabilities of the global IT and organizational infrastructures. The data was obtained from a top non-IT and a top IT executive of the MNC.

In general, the results reveal that global interdependence is positively associated with strategic orientations treating the national units as a single entity. The levels of global interdependence are positively associated with the use of mechanisms for lateral coordination while the levels of correspondence are negatively associated with the use of mechanisms for vertical coordination of the organizational infrastructure. No support was found between the industry globalization potential and the strategic orientation adopted by the MNC.

Global interdependence on human resources is positively associated with the network, data, and platform capabilities of the global IT infrastructure. Global interdependence has a positive impact on the levels of support services offered by the global IT infrastructure. Planning of the capabilities of the global IT infrastructure is positively associated with global interdependence on physical, information, and human resources.

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I dedicate this dissertation to the memory of my grandfather João, who, together with my grandmother Hilda, gave me constant encouragement to finish this work and who were very understanding of the fact that I could not be closer to them during his illness. I hope that, wherever he is right now, he may feel a little prouder of his grandson.

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CHAPTER 1

Introduction

For information technology (IT) to have a positive impact on the efficiency and effectiveness of globally integrated operations of multinational corporations (MNCs), the computer and telecommunication systems must be properly established and deployed. Information systems (IS) researchers argue that the proper design and deployment of IT in an organization is one where there is an alignment between IT and the firm's strategy (King 1978, Henderson and Venkatraman 1992, Broadbent and Weill 1993, Luftman 1996). Yet, global IT researchers, in conceptually and empirically sound studies, have not found strong support to this paradigm in multinational organizations. Gibson (1992), for example, using the information processing theory, found that only 37% of its sample pursued an IT architecture compatible with the strategic role of the subsidiary. Sethi (1992), in a comprehensive study using a cross-theoretical perspective, found fit between the IS and the MNC business strategy in 55% of his sample. Similarly, Jarvenpaa and Ives (1993), also using the information processing perspective, report that the alignment between the requirements of different MNC strategic types and the capabilities offered by the global IT configuration of the firm occurred only in 56% of the firms they studied. It is therefore clear that, although important progress has been made, we still lack clear understanding of *what* drives the design of IT in MNCs and *how* MNCs develop their IT

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capabilities to effectively respond to the requirements of the strategy adopted by the MNC.

In searching for answers to help us understand why the IT-strategy alignment paradigm has not found strong support in the study of MNCs, we observed that the majority (if not all) of the empirical studies have approached the problem by mapping IT to typologies of business strategies for MNCs. Such typologies, although conceptually very appealing, posit a series of concerns. First, they are notably difficult to operationalize (Broadbent 1997). Secondly, over the years multinational firms have developed very different ways of organizing (Hagström 1997). As multinational organizations increasingly innovate and differentiate their strategies, typologies with limited options can quickly become weak in explaining not only IT but also other elements of the organizational design.

We must therefore study the linkage between IT and the MNC strategy from a perspective that is more powerful and enduring in explaining their association. Our study approaches the problem by filtering different strategic orientations pursued by MNCs into structural requirements that must be met by the capabilities developed by the organization. We use the concepts of interdependence and correspondence borrowed from organizational theory and apply them to a framework of global integration to explain the characteristics of the IT infrastructure and other administrative elements of the firm. We propose that different strategic orientations adopted by the MNC will have different implications to the levels of global interdependence among the several national units, which, in turn, establish the requirements to be met by the IT and organizational infrastructures of the firm.

Besides this primary objective, this study also aims at informing the practice of international management by developing a theory driven framework synthesizing our current understanding of global integration in multinational corporations (MNCs). Global integration has taken substantial attention from both academics and managers of MNCs (Porter 1986, Ghoshal 1987, Bartlett and Ghoshal 1989, Kobrin 1991, Morrison and Roth 1992, Birkinsaw et al 1995). However, there is still a great deal of conceptual ambiguity about what global integration really means (Ghoshal 1987). Authors have treated global integration at their will, sometimes emphasizing either the firm's strategy (Morrison and Roth 1992, Birkinsaw et al 1995), or the firm's structure (Bartlett and Ghoshal 1989), or, at a more aggregate level, the industry context (Porter 1986, Kobrin 1991, Makhija et al 1996). Although all these aspects are indeed related and characterize global integration, the lack of a comprehensive conceptualization leaves managers of MNCs without a framework from which they can analyze the appropriateness and the requirements of global integration in their firms. There is therefore a need to develop a conceptual framework that addresses and synthesizes our current understanding of global integration in multinational organizations. Such a framework would contribute to the international business practice by providing an analytical tool that focuses the attention of MNC managers on all relevant issues and relationships that encompasses global integration in multinational organization. At the same time, it would serve to delineate and organize in a systematic manner the boundaries of our research efforts on global integration.

This thesis responds to this need by developing and testing a conceptual model that explains the design choices for both the IT and organizational infrastructures of the MNC based on a proposed framework of global integration. We define global integration

as the effective alignment of the organizational design (characterized by the IT and organizational infrastructures of the MNC) to the levels of global interdependence and global correspondence among national units which results from the global strategic orientation adopted by the MNC.

In the following chapters we provide a more detailed description of this study in the following manner: In the next chapter we provide the theoretical background for the investigation of global integration in MNCs. We also describe the IT and organizational infrastructures of the MNC by defining and characterizing them along dimensions relevant to this study. Following we present the research model describing the expected relationships among the several constructs identified. In the research methodology chapter, measurement issues and details of the empirical study to test the proposed model are then presented. The next chapter analyzes the measurement properties of the instruments developed for the study. We then test the several proposed relationships and discuss the results. The final section explores the contributions, limitations and future research based on the findings of this study.

CHAPTER 2

Theoretical Development and Research Model

2.1 Global Integration in Multinational Corporations

The concept of global integration is not new to the field of international business (Porter 1986, Bartlett and Ghoshal 1989, Kobrin 1991, Johansson and Yip 1994, Birkinshaw et al 1995). Due to a unique combination of economic, political, technological, and competitive pressures, multinational firms are compelled to treat their worldwide businesses as a single entity: products and services are standardized, the various value-added activities are distributed across multiple countries, marketing strategies focus on same brand names and advertising campaigns, and competitive moves aim at improving the overall global competitive position of the firm (Yip 1989, 1992). To implement such a posture, the several units of the MNC must increase their level of interaction, sharing and exchanging tangible and intangible resources. They are no longer completely independent entities. Instead, they depend on resources being provided by the network of units to operate and survive. In order to manage the new set of requirements imposed by the increased interconnection of units, several coordinating mechanisms and processes are put in place by the MNC, supporting and facilitating the flow of resources through the several value-added activities distributed among the units of the MNC.

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Although there is a general agreement on this overall characterization of global integration, we lack a conceptual framework that clearly specifies and integrates the several dimensions of global integration. As suggested by Hamel and Prahalad (1985), the distinction among the several constructs embedded in the characterization of global integration is blurred in the literature. The term global integration is often used to concurrently refer to either the firm strategy, the firm structure, or to the characteristics of a particular industry. In this sense, the first logical step in our study is to explicitly account for all constructs that are related to global integration in multinational organizations.

We propose that the study of global integration in multinational corporations must entail our attention to the following aspects of the MNC:

    (a) The *global strategic orientation* of the multinational firm;

    (b) The levels of *global interdependence* on resource flows among the national units;

    (c) The levels of agreement among the national units (*global correspondence*);

    (d) The *global infrastructure* or mechanisms developed for operations management.

These four elements can altogether characterize global integration in multinational firms but they are not sufficient to explain the motivation of the MNC to pursue global integration. The literature suggests that this motivation is in grand part defined by the structural characteristics of the industry in which the MNC operates. These characteristics of the global external context define the *industry globalization potential*,

and manifest the likely gains to be realized by multinational firms within the industry that opt to pursue globally integrated operations.

The different treatments and studies of global integration in a multinational firm all revolve around these five constructs. However, they have not yet been captured in a comprehensive study of global integration. Kobrin (1991), for example, studied the impact of industry characteristics on the levels of global integration, relying solely on the levels of intra-firm trade. Morrison and Roth (1992) focused their attention on the business level strategy of multinational firms in global industries. Johansson and Yip (1994) captured most of these dimensions in their comparison of global integration in American and Japanese firms but did not explicitly take into consideration the levels of interdependence and correspondence among national units. In addition, the constructs identified are not clearly, explicitly defined for the context of global integration.

One contribution of this study lies in further exploring and defining these constructs while at the same time making explicit their relationships within the context of global integration. The following sections explore in more detail each of the constructs identified. We then build our propositions by establishing relationships among them.

2.2 Industry Globalization Potential

We define industry globalization potential as the extent to which the structure of the industry provides opportunity for leveraging worldwide resources. Industries differ along several dimensions that have been invariably referred to by the literature as the structural characteristics of the industry (Porter 1986, Morrison 1990, Kobrin 1991, Yip 1992; Birkinshaw et al 1995). Some of these dimensions are closely associated with the

potential present in the industry for the exploitation of resources on a global basis. Their presence either facilitate or increase the pressures towards globalization, where national boundaries become blurred and both the business and technological environments of the industry in a country affect the environments of the same industry in another country. In this sense, the drivers of globalization incorporate the potential benefits that businesses may accrue from the exploitation of resources on a worldwide basis. They create conditions that facilitate or demand the effective use of resources from a global rather than a national perspective. Several global drivers have been suggested in the literature (Porter 1986, Kobrin 1991, Yip 1992, Birkinshaw et al 1995), and among the most significant are:

(a) Market Homogenization

(b) Economies of Scale

(c) Comparative Advantages

(d) Technological Intensity

Market Homogenization

Market homogenization refers to the extent to which customers within the industry demonstrate similar needs and preferences across the globe. Potential to globalization offered by market homogenization of the industry relies primarily on the general behavior of customers across the globe (Yip 1989). Over the recent years, thanks to lower transportation and communication costs, customer needs and preferences across the globe for some industries have become more homogeneous (Levitt 1983). This creates opportunities for the development of a worldwide market, with buyers and

suppliers operating on a global basis, searching and offering standardized products not within national boundaries but across the globe.

Economies of Scale

Economies of scale refer to the extent to which the production volumes at the optimum scale require more than a single-country market. Hout et al (1982) argued that the potential for globalization increases when benefits can be gained from worldwide volume. When a single country market is not large enough to allow for production volumes that exhaust economies of scale, firms within the industry may feel compelled to extend their participation to other markets, so that production may run at optimal levels.

Comparative Advantages

Comparative Advantages across countries refers to the extent to which factor costs or the availability of particular skills varies across countries. As suggested by Yip (1992) these differences may be significant enough to create a potential and encourage the dispersion of the value-added activities across the globe. Through this dispersion, multinational firms either reduce costs or increase the productivity of their operations. If the potential gains from comparative advantages are pursued by MNCs, activities of the value chain will tend to be located in low cost and/or high skill countries (Johansson and Yip 1994).

Technological Intensity

Technological refers to the rate of change experienced by products, services, and production process particular to the industry. Several industries have been facing a steady

increase in the pace of technological change over the past 20 years. The life cycle of several products and production processes have been shortened to a point where firms are forced to (a) reduce duplication of their research and development activities, (b) keep the levels of product and process customization to a minimum, and (c) fund the R&D efforts with revenues from multiple markets. Firms within technology intensive industries are therefore motivated to globalize their activities, in an attempt to reduce the pressures created by increasing R&D costs (Kobrin 1991).

2.3 Global Strategic Orientation

Global strategic orientation will be defined as the extent to which the multinational organization treats the several dispersed national units as a single entity. Global strategic orientation depicts the managerial choices for the worldwide business along a number of strategic dimensions (Yip 1989, Yip 1992, Kogut and Kulatilaka 1994), which include the following:

(a) Marketing Approach

(b) Operational Flexibility

(c) Market Participation

(d) Competitive Moves

(e) National Unit Role

Marketing Approach

Marketing approach refers to the extent to which the MNC makes use of similar products, brand names, advertising campaigns and other marketing elements across country markets. The levels of product and service standardization across countries are

perhaps the most commonly identified concept in a strategy that stresses global integration. Although fully standardized products and services are rare, global products and services tend to revolve around a core that is marginally customized according to different needs of markets (Yip 1992). In addition, an integrated marketing approach to product design, product and brand positioning, brand name, packaging, pricing, advertising strategy, advertising execution, promotion and distribution are all candidates for a standardized marketing approach. Although some elements might be more uniform across countries than others, the intent of creating an unified, undifferentiated approach to products and services offered by the MNC clearly define a more globally integrated strategic orientation.

Operational Flexibility

Operational flexibility in a global context refers to the extent to which activities are dynamically reallocated across units in response to uncertain events. Kogut (1985) proposed that global strategies seek to reduce the impact of uncertain events such as government policies, variation in exchange rates, etc. by adding flexibility to the operations of the MNC. In a "flexible" MNC the scheduling of activities for a particular unit is not fixed. Instead, activities are dynamically reallocated according to the environmental opportunities offered across country markets where the MNC operates. This dimension captures the extent to which the MNC makes use of such strategy.

Market Participation

Market participation captures the extent to which national markets to conduct business are chosen based on the global competitive positioning of MNC. As Yip (1992)

suggested, MNCs decide what markets they establish operations based on either their stand-alone attractiveness or their potential contribution to the overall global positioning of the business. MNCs seeking the benefits of global integration stress the global strategic importance of the markets where they operate and might decide to enter a market even if the market itself is not attractive.

Competitive Moves

Competitive moves refer to the extent to which competitive decisions for a national unit involve the participation of multiple units of the MNC. Under a global strategic orientation, competitive decisions are made in a more integrated manner. Rather than focusing primarily on the effects of a unit's competitive position in the country where it operates, the MNC develop strategies that aim at an increase in the levels of global competitiveness. Strategies of cross-subsidization, where units in better positions provide support to units under high levels of competitive pressures, is an example of global competitive moves (Hamel and Prahalad 1985).

The overall evaluation of these managerial choices defines the strategic orientation of the multinational firm. The literature (Porter 1986, Morrison 1990, Yip 1992) proposes that the strategic orientation lies along a continuum that goes from multi-domestic at one end to global at the other end. In a MNC with a multi-domestic orientation, products are highly customized to fit local needs and preferences, marketing strategies are developed locally and are tailored for each country, and competitive moves are made without regard for what happens in other countries. In addition, the decision of

the MNC to enter a particular market is based solely on the stand-alone opportunities offered by that country. On the other hand, a multinational firm with a global strategic orientation develops standardized products worldwide, use uniform marketing approaches across the globe, and make integrated competitive moves, aiming at the overall global competitiveness of the firm. Market participation is highly influenced by the global positioning of the firm with respect to other global competitors.

2.4 Global Interdependence and Correspondence

2.4.1 Interdependence and Correspondence

The concept of unit interdependence is not new to the organization theory literature. In fact, "most considerations of organizational design ultimately derive from the interdependence that exists within organizations because of the division of labor that occurs among positions" (Pfeffer 1978, p. 31). When the total task necessary to achieve a particular goal is broken up into several tasks, each of these smaller tasks become interdependent with one another (Thompson 1967). In order to accomplish the total task, each of the smaller tasks will need to be performed by the organizational actors responsible for them. In this sense, interdependence exists "whenever one actor does not entirely control all of the conditions necessary for the achievement of an action or for obtaining the outcome desired from the action" (Pfeffer and Salancik 1978, p.40). Within the organizational domain, interdependence can be defined as "the extent to which a unit's outcomes are controlled directly by or are contingent upon the actions of another unit" (Victor and Blackburn 1987, p. 490).

The above characterization of interdependence implies the inevitable need of organizational actors to interact with one another for the achievement of the desired organizational goals. The specialization of units in different aspects of the overall task of producing a good or providing a service by the organization requires a level of interaction among these units for the accomplishment of the total task. If there is a lack of coordination of activities among the interacting actors, interdependence will create situations of uncertainty and unpredictability (Pfeffer and Salancik 1978). Organizations are therefore designed in ways that coordinate effectively the level of interdependence among the organizational actors (Thompson 1967).

A fundamental assumption carried by several pieces of the literature on organizational design (e.g., Thompson 1967, Galbraith 1973), is that the implicit goal of the structuring process is *only* the achievement a more rationalized and coordinated system of activity. Structures are created so as to facilitate the connection and completion of interdependent tasks. This is also very consistent with the industrial economic view of organizations, such as the value chain perspective provided by Porter (1985). A company's value chain is a system of interdependent activities, which are connected by linkages. Because these linkages exist (i.e., the tasks are not completely independent), activities must be coordinated. Porter therefore poses that a powerful source of competitive advantage is the careful management of these linkages. For Thompson (1967), careful management of linkages means an attempt to minimize coordination costs while Galbraith (1973), with his concern for information-processing considerations, emphasized the communication costs involved in coordinating interdependent activities.

However, when talking about the structuring of organizations, the technical requirements of interdependent tasks are not the only source of variance for the organizational design. As others (Lawrence and Lorsch 1967, Pfeffer 1978, Victor and Blackburn 1987) have pointed out, besides aligning and connecting tasks physically distributed among organizational actors, managers should also ask for the appropriateness of a given structure for handling the different interests and point of views maintained by the several actors. The structure of the organization should not only coordinate interdependent tasks but also control the behavior of organizational actors so that they serve the organization's interests rather than their own (Perrow 1986), and make decisions using criteria relevant to the achievement of organizational goals (Pfeffer 1978).

As Lawrence and Lorsch (1967) have suggested, the division of labor also had consequences on the attitudes and behaviors of organization members, leading to different orientations and practices that are equally related to the effective management of interdependencies. Organizational actors responsible for different tasks within the organization might have a different orientation towards particular goals, time frames, priorities, etc. that make the process of coordinating interdependent tasks even more complex. Unless a high level of agreement or correspondence exists among members with respect to goals and priorities of the organization, the structure of the organization will also need to account for those differences through the development of mechanisms that control and monitor attachment to the organizational goals.

The task of structuring an organization and providing it with effective coordination and control mechanisms can therefore be said to be a function of two

factors: (1) *the levels of interdependence* among organizational actors created by the division and specialization of units in particular tasks, and (2) *the levels of correspondence* or agreement among organizational actors with respect to the overall goals, priorities, and interests of the organization.

2.4.2   Interdependence and Correspondence in Multinational Corporations

A multinational corporation is, by definition, comprised of units or subsidiaries that are dispersed across the globe. The mere existence of international operations suggests that the organization finds an advantage in maintaining ownership over such operations, rather than completely transferring control to agents located in the several countries where operations are conducted (Calvet 1981). International operations of the multinational corporation are therefore justified on the basis of market failures and the relative internal efficiencies of the relationship between parent and foreign units.

The establishment of international operations under control of the parent organization implies a level of interdependence between foreign units and the corporate headquarters. The several foreign units exist as an alternative to the market, and their main purpose is the execution of tasks and activities that are conducive to the overall goals and objectives of the parent organization. The operations of these foreign units therefore play an important role in determining the overall outcome or performance of the parent organization. The foreign units control the means through which the parent organization realizes its strategy. On the other hand, because of the ownership relationship kept by the parent, the foreign units can not act as completely independent entities. The parent organization maintains control over vital resources that guarantee the

operations and existence of the foreign unit. We may therefore say that the nature of the relationship between parent and foreign units by itself involves a level of interdependence.

In addition to this inherent level of interdependence created by the nature of the relationship between foreign and parent units, more recent strategic orientations adopted by the multinational corporation further enhance the levels of interdependence among these two units and also create interdependence among foreign units themselves. Pressures and opportunities for globalization created by the industry environment in which the MNC operates induce intent on the part of the MNC to develop strategies that treat the worldwide network of units as a single entity (Porter 1986, Prahalad and Doz 1987, Bartlett and Ghoshal 1989). When motivated by conditions of globalization in the industry, the MNC may adopt a posture that de-emphasizes strategies where foreign units maintain only minimum levels of interaction with the parent organization and operate autonomously. Rather, the MNC fosters competitive actions taking a collective character, aiming at the global rather than local competitive positioning of the several units comprising the multinational firm. This shift towards a collective, integrated posture has further implications to the levels of interdependence within the MNC. Unit specialization in particular tasks of the value chain, concerted plans of action with respect to products and services, etc. eventually increase the level of control of a unit over the activities and outcomes of other units. The decisions at both operational and strategic levels made by a unit impacts its own outcome and also the overall performance of multinational system. To cope with this increased level of interconnectedness, the MNC must develop mechanisms that better manage the levels of interdependence.

However, even within this context of collective action and interdependence, the MNC may still develop a strategic orientation towards the local peculiarities of the environment where the several units operate. This orientation is usually the result of managerial responses to institutional pressures acting on the unit (Oliver 1991). In this sense, foreign units may choose or are expected to adapt to singularities in tastes and preferences of the local market, to conform to host government regulations, to operate according to local customs and traditions, etc. The move towards integrated and collective actions that raises the levels of interdependence within the MNC must therefore occur without compromising a certain level of adaptation and flexibility of the foreign unit to local requirements and constraints. In this sense, relationships within the network of units that comprise the MNC are better characterized as a "mixed-motive" situation, where both interdependent and independent interests of the several units coexist (Ghoshal and Nohria 1989).

The interdependent interests are mainly associated with the nature of the parent-foreign unit relationship and the strategic orientation on the part of the MNC of pursuing globally integrated operations. Because the assumption behind a globally integrated MNC is that the several units benefit from the interaction with one another and are better able to attain the MNC's goals acting collectively, the efforts of all units involved would be expected to take place under a climate of cooperation. The management mechanisms put in place by the MNC would therefore aim at facilitating the interaction and resolving the technical complexities associated with the interconnectedness of operations. In contrast, local and independent interests would lead to a situation of divergence or non-correspondence in goals and objectives among the several units comprising the MNC.

This non-correspondence of goals and objectives create a potential for conflict since integrated and synchronized operations may limit the competitive actions of a unit within its local context. To cope with this potential for conflict and to avoid the detrimental misalignment of a foreign unit, the MNC must therefore develop mechanisms that monitor and guarantee the attachment of the foreign unit to the overall goals of the multinational organization.

Our study proposes that this conceptualization form the basis for designing and providing the MNC with appropriate administrative and information technology mechanisms. We argue that the capabilities and mechanisms that comprise the organizational and IT infrastructures of the MNC will be associated with (1) the levels of global interdependence and (2) the levels of global correspondence in goals and interests among the several units of the MNC. Different levels of global interdependence and global correspondence will be associated with a different set of mechanisms comprising the global organizational and IT infrastructures for the management of the MNC's worldwide operations. We would expect this set of mechanisms to vary both in content and magnitude under differing levels of global interdependence and correspondence. While the specific propositions of this study will be explored in more detail in a later section, the next section will introduce and discuss the dimensions of the global infrastructure of the MNC.

2.5 Global Infrastructure of the MNC

Global infrastructure will be defined as *the set of capabilities and mechanisms developed by the MNC for management of its worldwide operations.* For implementing

integrated operations in the MNC, a set of mechanisms to control and coordinate activities among the several dispersed units must be in place (Prahalad and Doz 1987, Bartlett and Ghoshal 1989, Martinez and Jarillo 1989). These mechanisms must be designed so as to facilitate the interaction among units and to monitor the units' attachment to the goals and objectives set by the MNC (Roth *et al* 1991). The global infrastructure therefore aims at resolving the complexities and reducing the uncertainties associated with the flow of resources within the network of units that comprise the MNC (Gupta and Govindarajan 1991). When taken altogether, the set of mechanisms define the overall level of capabilities developed by the MNC to manage its global operations.

Although mechanisms of coordination and control are not exclusive tools of multinational corporations, the special complexity of resource flows across politically, economically, culturally, and geographically distant locations is what make their use more critical in such firms. In an ideal state, the use of these mechanisms would make transparent the division of roles among units and reduce the effects of the environmental and organizational diversity to which the flow of resources within the MNC is exposed.

We conceptualize the set of mechanisms and capabilities offered by the global infrastructure in two broad sub-categories: the *global organizational infrastructure*, encompassing the traditional administrative and structural mechanisms, and the *global IT infrastructure*, dealing with the capability offered by the information and communication technologies.

2.5.1 Global Organizational Infrastructure

The global organizational infrastructure has been referred to by the literature as control mechanisms (Gupta and Govindarajan 1991), administrative mechanisms (Roth et

al 1991, Doz and Prahalad 1981), or mechanisms of coordination (Martinez and Jarillo 1989). For the purposes of this study it will be defined as being the administrative capabilities developed by the MNC for management of its worldwide operations. Also for the purpose of this dissertation, a distinction is not made between control and coordination. We will use these terms interchangeably to refer to the management of the MNC's worldwide operations.

The organizational infrastructure revolves around several mechanisms. Mintzberg (1979) argued that a firm coordinates work through five basic mechanisms: mutual adjustment, direct supervision, standardization of work process, standardization of work output, and standardization of work skills. Lawrence and Lorsch (1967) also postulated five mechanisms to coordinate work activity: integrative departments, permanent and/or temporary cross-functional teams; reliance on direct management contact at all levels of the firm; integration through the formal hierarchy; and integration via a "paper-based system" of information exchange.

Martinez and Jarillo (1989) have made a comprehensive review of how multinational corporations make use of the coordination mechanisms proposed in the literature of organization theory. In their study, they make a distinction among formal or less formal and subtler mechanisms of the organizational infrastructure based on the mechanism's ability to control or coordinate the activities of the several national units. Formal mechanisms are those responsible for vertical coordination or control of the multinational organization and include:

(a) *Centralization,* or the extent to which the locus of decision making lies in the higher levels of the chain of command within the MNC.

(b) *Formalization,* or the extent to which the MNC makes use of policies, rules, job

descriptions, etc., written down in manuals and other documents.

(c) *Output control,* which captures the extent to which the MNC makes use of financial

performance reports, sales and marketing data, etc. to monitor the unit performance.

(d) *Behavioral control,* capturing the extent to which the MNC makes use of direct

surveillance and evaluation of activities performed.

The less formal mechanisms are those providing greater capability of lateral

coordination among national units of the MNC. Among the mechanisms for lateral

coordination, Martinez and Jarillo (1989) include:

(a) *Lateral relations,* which captures the extent to which the MNC makes use of formal

meetings, temporary or permanent task forces, teams, committees, integrating roles,

integrative departments, etc.

(b) *Informal communication,* capturing the extent to which the MNC makes use of

informal and personal contacts among managers across different units of the MNC,

corporate meetings and conferences, etc.

(c) *Socialization,* which indicates the extent to which the MNC makes use of a process of

socialization where individuals learn the way of doing things, the decision making

style, and the objectives and values of the organization. This is usually accomplished

through training programs, managing career paths across units, reward systems, etc.

2.5.2 The Global IT Infrastructure

Over the past ten years, the notion of IT infrastructure has been receiving

increasing attention from the information systems literature (Allen and Boyton 1991,

Weill 1993, Duncan 1995, Broadbent et al 1996, Broadbent 1997). IT infrastructure is a

major business resource (Broadbent et al 1996) and is increasingly being recognized for its contribution to the achievement of sustainable competitive advantage (Keen 1991, Davenport and Linden 1994).

The information technology infrastructure encompasses a set of computer based capabilities developed by the firm which provide the foundation for the development and implementation of other business systems (McKay and Brockway 1989). Through the IT infrastructure, organizational units are provided with a set of technologies and services that are sharable and reusable (Duncan 1995). IT resources such as hardware platforms, data, networks and communication technologies, etc. (Allen and Boyton 1991, Duncan 1995, Broadbent et al 1996) are integral part of the IT infrastructure. They aim at supporting core business activities (Brancheau, Janz and Wetherbe 1996) and providing a means for integrating business processes (Broadbent and Weill 1997). Also considered part of the IT infrastructure are the managerial and support activities that shape and bind together the set of IT resources of the infrastructure (McKay and Broadway 1989, Weill 1993, Duncan 1995, Broadbent et al 1996). These human based activities provide the policies, architectures, plans, standards, and rules governing the deployment of IT resources across the organization (Keen 1991, Duncan 1995, Broadbent et al 1996). They also provide a means of maintaining and supporting the set of IT capabilities across the organization (Broadbent et al 1996).

Figure 2.1 depicts the various elements of the IT infrastructure (drawing particularly on McKay and Broakway 1989, Weill and Broadbent 1994 and Broadbent et al 1996). At the base of the model are the IT components, such as hardware platforms, operating systems, network and telecommunication technologies, databases, etc. The

second layer comprises a set of shared support services such as management of communication networks, data management, identification and testing of new technologies, etc. The knowledge, skills, and experience of the human component convert the IT components into capabilities that allow the development of systems that are closely aligned with the organization's structure and strategy (Broadbent 1997). Through this fusion of technology and human components it becomes possible to achieve (a) hardware and operating systems interoperability, (b) network connectivity, and (c) data transparency (Duncan 1995, Broadbent et al 1996).
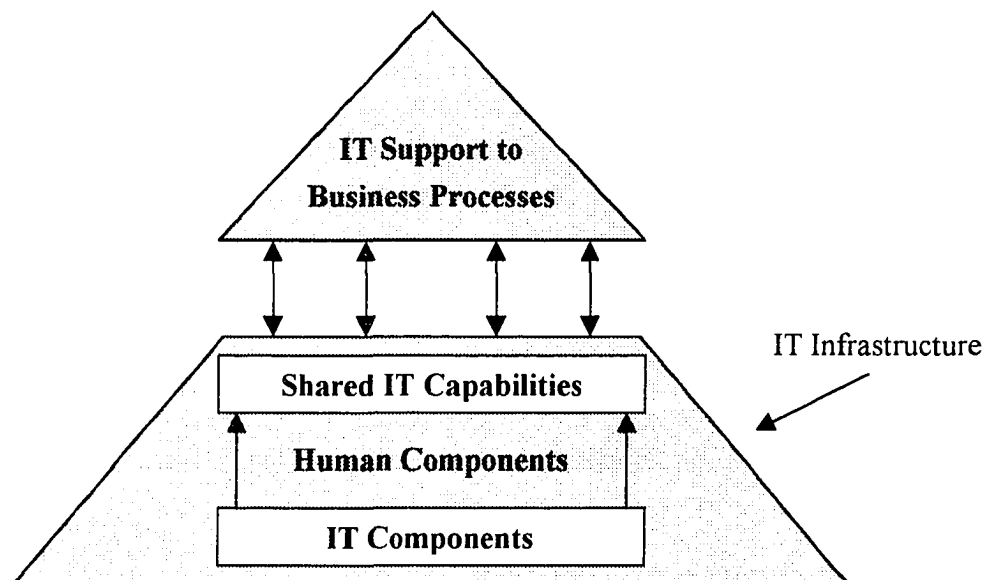
Figure 2.1 – The Components of the IT Infrastructure

Keen (1991) refers to level of IT capability offered by the organization as the *range* of the IT infrastructure. Range within the domain of a global IT infrastructure can be further defined for each component of the IT infrastructure as follows:

- *Network connectivity* refers to the level of electronic coupling between the national

  units of the MNC. It captures the extent to which the network connections (if any)

  support data transmission and communications among units of the MNC.

- *Platform interoperability* refers to the extent to which IT resources can be reallocated

  seamlessly across units of the MNC. This dimension conveys the degree of

  compatibility and/or standardization found in operating systems and hardware

  platforms dispersed across the units of the MNC (Gibson 1992, Duncan 1995).

- *Data transparency* refers to the extent to which data is integrated across units of the

  MNC. Data transparency captures the levels of logical consolidation found in the data

  structures of the several databases across the MNC. Data transparency is related to the

  standardization of data semantics (definitions, names, identifiers, domains, and

  constraints) across organizational units (Wybo and Goodhue 1995).

Keen (1991) also refers to the IT infrastructure in terms of its reach. **Reach** of the

IT infrastructure refers to the number of units within the organization that are provided

with the set of capabilities that comprise the IT infrastructure. Reach is concerned with

the extent to which network connectivity, hardware interoperability and data transparency

is available across the organization. Within the context of multinational organizations,

reach captures the number of national units that are served by the global IT infrastructure.

2.6 Research Model

Figure 2.2 depicts the research model. It proposes the relationships between the

antecedents of global interdependence (industry globalization potential and global

strategic orientation), the proposed drivers of the infrastructure design (global

interdependence and correspondence), and the elements of the global infrastructure (global organizational infrastructure and global IT infrastructure). The next few paragraphs provide an overview of the entire model before justifications for the several propositions are presented.

The model poses that the industry globalization potential, defined as the extent to which the structure of the industry provides opportunity for leveraging worldwide resources, influences the global strategic orientation of the MNC. Global strategic orientation is defined as the extent to which the multinational organization treats the several dispersed organizational units as a single entity. Managers of MNCs perceive the opportunities offered by the industry in which their firms operate and define the global strategic orientation of the MNC. The pursue of a strategic model that treats the MNC as a single entity will have consequences to the levels of global interdependence, increasing the level of resource exchange among national units and the level of specialization of units on specific activities of the value chain. Global interdependence is defined as the extent to which the operations of the multinational organization are contingent upon the interaction among units.

The increased level of global interdependence must be managed so as to reduce the uncertainty associated with the flow of resources among units of the MNC. Similarly, the levels of global correspondence, defined as the level of agreement among units with respect to the overall goals and objectives of the multinational organization, must also be managed so as to guarantee a minimum level of unit attachment to the goals and priorities of the MNC. The global infrastructure or the set of capabilities developed by the multinational organization for the management of its worldwide operations is developed

in response to these requirements. We propose that the primary purpose of the capabilities developed by the MNC through its organizational and IT infrastructures is the management of the levels of global interdependence and global correspondence among national units. The nature of these capabilities distinguishes them as belonging to either the organizational infrastructure (the capabilities offered by administrative mechanisms for the management of the MNC's worldwide operations) or the IT infrastructure (the capabilities offered by information and communication technologies for the management of the MNC's worldwide operations). The higher the levels of global interdependence, the greater will be the capability of the global infrastructure of facilitating lateral coordination and communication among units. Similarly, the lower the levels of global correspondence, the greater will be the presence in the global infrastructure of capabilities that allow the MNC to monitor and control the behavior and operations of national units. The following paragraphs explore the logic of these relationships in more detail and posit the propositions driving this study.

```
┌─────────────────────┐
│      INDUSTRY       │
│   GLOBALIZATION     │
│     POTENTIAL       │
└─────────────────────┘
          │ P1
          ▼
┌─────────────────────┐
│  GLOBAL STRATEGIC   │
│    ORIENTATION      │
└─────────────────────┘
          │ P2
          ▼
┌─────────────────────┐
│      GLOBAL         │
│  INTERDEPENDENCE    │
└─────────────────────┘
      P5  /    \  P3
         /      \
        ▼        ▼
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| GLOBAL IT INFRASTRUCTURE | GLOBAL ORGANIZATIONAL INFRASTRUCTURE | P4 ← | GLOBAL CORRESPONDENCE |
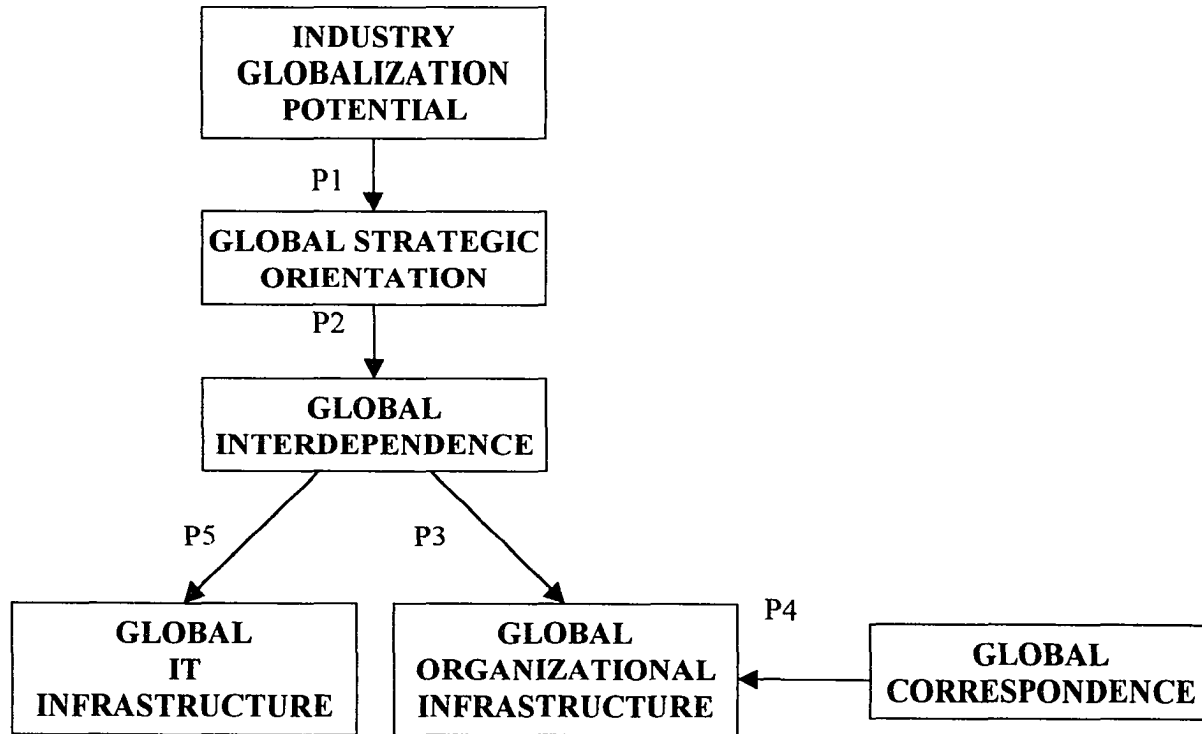
Figure 2.2 – Research Model

A central tenet in strategy is that a firm takes actions towards the maximization of its 'fit' with the structural characteristics of the industry in which it operates. In this sense, all things being equal, firms with a global strategic orientation are more prevalent in an industry dominated by drivers or structural determinants of globalization (Hout et al 1982, Yip 1992, Kobrin 1991, Birkinshaw et al 1995). The presence of these drivers determines the industry globalization potential. Managers perceive the pressures and/or opportunities for globalization being offered by the context of the industry in which their firms operate and orient their choices towards a strategy of integration. We therefore propose that:

Proposition 1: *The MNC's global strategic orientation is positively associated to the globalization potential of the industry.*

Proposition 1 presents the predictive logic relating the constructs of globalization potential of the industry and the MNC's global strategic orientation. We have identified 4 dimensions for industry globalization potential and 5 dimensions for global strategic orientation. Thus, each of the industry globalization potential dimensions generates 5 related hypotheses, one for each of the dimensions identified for global strategic orientation. These hypotheses are listed in the Appendix section.

The adoption of a global strategic orientation by the multinational corporation has several implications to the way resources and activities are allocated across units (Kobrin 1991). In a multi-domestic firm, where the levels of global strategic orientation are low,

each unity is a self-sufficient entity (Yip 1992). All resources necessary for the operation of the unit are available locally. Resources coming from the corporate headquarters and/or other units of the MNC are kept to a minimum. In addition, the unit usually performs most if not all activities of the value chain. However, as management adopts a more global strategic orientation, the allocation of resources become more rationalized (Kobrin 1991). Units become specialized in particular activities of the value chain and are no longer self-containing or self-sufficient—they must transact with each other obtain the resources necessary for their operation. This inevitable need to transact with other units who possess the remaining conditions for operation creates global interdependence among the units of the multinational organization. As the strategic orientation of the MNC moves towards a globally integrated one, the greater the levels of global interdependence will be, manifested by more intense and complex resource flows among units and by a greater degree of unit specialization. We therefore posit that:

Proposition 2: The levels of global interdependence are positively associated with the MNC's global strategic orientation.

Proposition 2 presents the predictive logic relating the constructs of global strategic orientation and global interdependence. We have identified 5 dimensions for global strategic orientation. For the construct of global interdependence, an exploratory factor analysis will determine how the operational dimensions identified by McCann and Ferry (1979) for interdependence group together (these operational dimensions will be further discussed in the Research Methodology chapter). We have therefore generated a

hypothesis for each of the factors identified for global strategic orientation. These hypotheses are listed in the Appendix section. If more than one dimension for global interdependence is identified, the related hypotheses will be restated accordingly.

Interdependence creates situations of uncertainty and unpredictability (Pfeffer and Salancik 1978). In order to cope with this increased level of uncertainty, organizations increase coordination, restructuring their exchange relationships in ways that each other's behavior becomes more predictable (Pfeffer and Salancik 1978). Coordination involves the development of mechanisms to manage interdependence. Chandler and Daems (1979, p. 400) define coordination as the "process of scheduling and standardizing the flows and transactions between activity cells." Over time, organizations have developed many mechanisms for coordinating their interdependent activities. According to the information processing theory (Galbraith 1973), organizations can cope with increasing uncertainty and complexity through investment in vertical information systems or through creation of lateral relations. However, the literature have suggested and found evidence that increased levels of interdependence are more effectively managed by increasing the use of lateral, organic mechanisms (Thompson 1967, Van de Ven et al 1976, Victor and Balckburn 1987 Mintzberg 1993, Robey and Sales 1994).

A strategic orientation towards global integration leads to an increased level of global interdependence within the MNC. Martinez and Jarillo (1991, p. 441) found evidence that "an increase in the firm's integration level must be accompanied by an increase in the coordination, and the mechanisms to be introduced or reinforced will probably be the more subtle ones." The more "subtle" mechanisms described by Matinez and Jarillo are the lateral coordination mechanisms described by the organization theory

literature. They include mechanisms for lateral relation, informal communication, and socialization. Based on the above discussion and Martinez and Jarillo's findings, we therefore propose that:

Proposition 3: The capability of lateral coordination present in the global organizational infrastructure is positively associated with the levels of global interdependence among units of the MNC.

Proposition 3 presents the predictive logic relating global interdependence and the mechanisms for lateral coordination of the global organizational infrastructure. While an exploratory factor analysis will determine the dimensions of global interdependence, 3 dimensions or mechanisms for lateral coordination have been previously identified. We therefore generated a hypothesis for each of the mechanisms for lateral coordination of the global organizational infrastructure. These hypotheses are listed in the Appendix section. If more than one dimension for global interdependence is identified, the related hypotheses will be restated accordingly.

The amount of correspondence among units has also been proposed as a determinate of the effectiveness of the organizational design. At high levels of correspondence, organizations may use simple rules and guidelines to manage activities common to multiple units (March and Simon 1958). As the amount of disagreement increases, organizations need to use more assertive hierarchical or forcing methods to manage the relations between units (Lawrence and Lorsch 1967, Victor and Blackburn 1987). As the amount of non-correspondence increases, conflict resolution requirements

increase. To resolve increasing amounts of disagreement among units, the organizational

infrastructure must possess a higher capability of handling vertical coordination. This

translates into more formalization, centralization, and control mechanisms. Martinez and

Jarillo (1989) in their review of the literature, found support to this logic in studies of

multinational organizations. Mechanisms for vertical coordination such as centralization,

formalization, output control, and behavioral control are expected to be used more

intensively by multinational organizations where a high level of disagreement among

national units exists or where national units pursue their own strategic interests. We

therefore posit that:

Proposition 4: The capability of vertical coordination present in the global

organizational infrastructure is negatively associated with the levels of global

correspondence among units of the MNC.

Proposition 4 presents the predictive logic relating global correspondence and the

mechanisms for vertical coordination of the global organizational infrastructure. hree

dimensions have been identified for the construct of and have been identified for the

global organizational infrastructure. We have identified 3 dimensions for global

correspondence and 4 mechanisms for vertical coordination of the global organizational

infrastructure. Thus, each of the global correspondence dimensions generates 4 related

hypotheses, one for each mechanism for vertical coordination. These hypotheses are

listed in the Appendix section.

As suggested by Rockart and Short (1989), IT provides a new approach to the problem of effectively managing interdependence. Vastly improved communications capabilities and more cost-effective computer hardware and software have the power to enable the "wiring" together of individuals and units within the MNC. It is this IT capability of coordinating across functions and levels that provides the manager of the MNC with an additional set of tools for coping with interdependent activities and the concurrent flow of resources among the geographically and time distant units.

A number of organizational theorists have also studied the relationship between interdependence and the use of technology as a coordinating mechanism (Thompson 1967, Robey and Sales 1994). Thompson proposed that as the levels of interdependence increase, the sophistication and uses given to technology also increase. Recently, Kumar and van Dissel (1996) translated the observations of Thompson to a three-part typology for inter-organizational systems; information technologies designed to coordinate the relationships between units. The typology, directly mapped to the levels interdependence proposed by Thompson, increase in sophistication as the levels of interdependence change. In essence, higher levels of interdependence can be better managed with a portfolio of resources, technologies, and techniques, which, depending upon the situation, can be selected and applied in a variety of combinations (Robey and Sales 1994).

However, in order to support the exchange of information and make coordination feasible, the IT infrastructure must possess a set of characteristics that increases the capability of sharing and exchanging information (Gibson 1992, Mische 1995, Duncan 1995). Where increased interdependence exists, common data must be integrated so as to reduce inconsistencies, units must be better connected so as to provide a more efficient

exchange of information, and platforms should be compatible or standardized so as to allow the development of applications covering multiple functions and units. We interpret these characteristics as the capability of lateral coordination offered by the IT infrastructure since they aim at reducing the uncertainties associated with the technical complexities created by interdependence. They are designed so as to facilitate the exchange of information among units and to coordinate activities that span multiple national units.

Broadbent and Weill (1997) discuss the process of making decisions with respect to these capabilities of the IT infrastructure in light of the strategic context of the firm. They posit that "considering strategic context gives insights about what to coordinate across firms, what to leverage from within business units, and what to leave to local options" (p. 81). We therefore argue that the levels of interdependence derived from the strategic orientation adopted by the multinational organization establishes the requirements that must be met and the capabilities that must be offered by the IT infrastructure. Through the establishment of an IT infrastructure with a broader set of mechanisms for lateral coordination, the information processing capabilities of the organization increase (Bensaou and Venkatraman 1995), allowing the management of higher levels of interdependence. We therefore propose that:

Proposition 5: The capabilities offered by the global IT infrastructure are positively associated with the levels of global interdependence among units of the MNC.

Based on our previous discussion of what constitutes the capabilities offered by the global IT infrastructure, we may break down Proposition 5 into the following:

Proposition 5a: The range of the global IT infrastructure is positively associated with the levels of global interdependence among units of the MNC.

Proposition 5b: The reach of the global IT infrastructure is positively associated with the levels of global interdependence among units of the MNC.

Proposition 5c: The level of support services to the global IT infrastructure is positively associated with the levels of global interdependence among units of the MNC.

Proposition 5d: The planning of the global IT infrastructure is positively associated with the levels of global interdependence among units of the MNC.

The reach, range, and planning of the global IT infrastructure can be described for each of the components of the IT infrastructure (networks, data, and platforms). We therefore generated hypotheses relating global interdependence and the reach, range, and planning of the global IT infrastructure for each of these components. These hypotheses are listed in the Appendix section.

Similarly, the level of support services can be categorized along the primary and secondary activities identified by Broadbent et al (1997). We therefore generated two hypotheses from Proposition 5c. These hypotheses are also listed in the Appendix section.

CHAPTER 3

Research Methodology

3.1 Introduction

The purpose of this chapter is to present the design of the empirical study conducted to test the previously described research model. The empirical study allowed us to verify the hypothesized relationships between industry globalization potential, global strategic orientation, global interdependence, global correspondence and the organizational and IT infrastructures built by multinational organizations to manage its worldwide operations.

In this chapter we present the details of the research design. The research design translates into a set of decisions regarding the context and methods under which an empirical study is conducted. At the broadest level, one must decide between alternative methodological strategies such as experiments, field studies, or simulations (McGrath 1982). At a more detailed level there are decisions to be made concerning the level of analysis, data collection procedures, respondents, sample size, and the data analysis strategy.

Also part of the research design is the operationalization of the constructs. This aspect of the empirical study relates to the research design in that operational definitions must make sense within the context of the chosen research methodology. We discuss the operationalization of the constructs after presenting the details of the research design.

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Every methodology involves a number of decisions that have the potential to enhance or detract from our ability to provide answers to our research questions. The criteria for making decisions regarding the research design should therefore lead us to have "better" answers to the research questions of interest. A study should be designed so as to enhance the accuracy (or precision) of the answers to a particular question. In this study the primary question of interest is whether, and to what extent, the characteristics of the global IT infrastructure are associated with several organizational dimensions of the multinational corporation and, in special, the levels of global interdependence and correspondence. Our decisions regarding the research design should therefore optimize our ability to accurately answer this primary question.

3.2   Choice of a Research Method

Research methods are the various ways in which researchers can elicit knowledge about a problem or question (McGrath 1982). Runkel and McGrath (1972) use three criteria for evaluating various methodologies:

- Their ability to generate findings that can be generalized to a population.

- Their ability to precisely measure and control variables.

- The realism of the context in which the behaviors of interest are observed and measured.

This study employs a field survey method as its research strategy. A field survey method has the following characteristics (Stone 1978, Kraemer 1991):

- The researcher does not manipulate independent variables.

- Intact, naturally occurring systems are the object of study.

- The researcher attempts to minimize his intrusion on the system being studied.

- The focus is either with relationships between variables or with projecting findings descriptively to a predefined population.

- Variables are systematically measured by asking people structured, pre-defined questions about some aspects of a study population.

- Information is generally collected about only a fraction of the study population—a sample—and is collected in such a way as to be able to generalize findings to the population.

Our justification for the field survey methodology is based on the fitness of the above listed characteristics and the research questions of interest.

- *The researcher manipulates no independent variables:* The nature of the explanatory variables (industry globalization potential, global strategic orientation, global interdependence and global correspondence) and of the object of observation (multinational organizations) precludes manipulation by the researcher and therefore makes the experimental approach unfeasible.

- *Intact, naturally occurring systems are the object of study:* In this study we are interested in understanding what drives the characteristics of the IT infrastructure in multinational organizations. This is a very practical problem, one that takes place in already existing organizations. Our task is to test for and unveil the associations and relationships among the organizational variables that are believed to explain the phenomena of interest.

- *The researcher attempts to minimize his intrusion on the system being studied:* We would like to observe the phenomena of interest without affecting or biasing the

outcome (i.e., the characteristics of the IT infrastructure in MNCs). The intention of the study is to learn as much as possible about what drives the IT infrastructure in MNCs so that we can make recommendations about its design. The field survey study therefore becomes a viable option since manipulation of the independent variables does not occur and the researcher's influence over the organizational variables of interest is minimal if not null.

- *The focus is with relationships between variables or with projecting findings descriptively to a predefined population:* This study is intended to test a set of pre-specified hypotheses associating various dimensions of multinational organizations with the characteristics of their IT infrastructure. Based on the findings, we will be able to offer recommendations regarding IT investment decisions in multinational organizations. In this sense, the field survey fits well with the objectives of this study. Although field case studies would also offer a context in which hypotheses can be tested (Markus 1983, Lee 1989), that methodology is most often associated with hypothesis generation.

- *Variables are systematically measured by asking people structured, pre-defined questions about some aspects of a study population:* In order to establish relationships that are meaningful and applicable to more than a handful of organizations, we must measure the variables consistently across a study population. Survey studies accomplish this through the use of a standardized set of structured, pre-defined questions that ensures comparability of information about all participants of the survey. Through the use of a field survey we will be able to investigate in a

systematic, comparable way the association between IT infrastructure and several organizational dimensions of the MNC.

- *Information is collected from a sample so as to be able to generalize findings to the population:* The field survey study allows the researcher to make use of probability sampling, enabling a higher degree of confidence that the results of the study can be generalized to the population. We would like to have the results of our study establishing relationships among organizational variables and the characteristics of the IT infrastructure generalizable to a broader population of MNCs. This would increase the practical value of this study to managers in MNCs facing decisions regarding the IT infrastructure.

In summary, the field survey study was selected as the research method because of its properties. The field survey will allow us to study a large number of multinational organizations without affecting or biasing the object of observation (the characteristics of the global IT infrastructure), using a data collection procedure that will provide us with systematic and comparable quantitative data. The data collected through this field survey will also allow us to make recommendations that reach a broader population of multinational organizations.

3.3 Unit of Analysis

We chose the multinational organization as our unit of analysis or observation. Although we acknowledge the existence of organizational variation within the multinational corporation (Ghoshal and Nohria 1989), our study is primarily interested in capturing the association between the *overall* levels of interdependence, correspondence

and other organizational variables and the *overall* characteristics of the global IT infrastructure. We are particularly interested on the concept of IT infrastructure as a mechanism of integration for the network of national units. Indeed, the purpose of an IT infrastructure is to provide a set of *shared* information technologies and services (Broadbent *et al* 1996). We must observe the organization as a whole in order to verify if this assumption holds true in multinational organizations and what causes it to be true or not true. It is therefore necessary to investigate the issue from a broader perspective, including all units of the organization, rather than concentrating on dyadic relationships between headquarters and subsidiary.

Several multinational corporations are diversified firms, with operations across various industries. Since industry is one of the factors that we believes drive the global strategic orientation of the firm and consequently the levels of global interdependence and the characteristics of the global infrastructure, we decided to focus on the primary division or main business unit for those corporations that are diversified.

In summary, our unit of analysis is the multinational corporation as a whole, including all national units and the corporate headquarters. For those cases where the MNC operates in multiple industries, our focus will be on the primary division or business unit of the corporation.

3.4 Population Definition

Multinational organizations are the object of investigation of this study. We however decided to limit the population of MNCs from which our sample was to be drawn. This was done based on several factors that include:

- *Home Country:* We decided to limit our study to MNCs with their corporate headquarters in the United States. This choice was based on the fact that extending the coverage to multiple countries of origin would (a) increase the complexity of the study, (b) increase the costs associated with data collection, (c) create potential threats to the internal validity of the study.

- *Number of National Units:* This study assumes some level of sophistication in the worldwide operations of the MNC. Thus, we decided to include in the population from which the sample was to be drawn only those firms with at least three national units (the corporate headquarters and at least two other national units).

- *Industry Sector:* Preferably, the study should have included firms from both the manufacturing and the service industry sectors. However, the development of an instrument that is context independent and that could be submitted to firms operating in both the service and manufacturing sectors proved to be unfeasible. We therefore decided to limit the scope of this study to multinational firms within the manufacturing sector.

Limiting the population from which the sample is to be drawn does pose some generalization problems. In light of the trade-off between the complexity, costs, quality of data and somewhat restricted generalizability of the findings, the judgment was made to take those steps in the direction of reducing the research complexity, costs, and generating the most meaningful data possible.

3.5 Target Respondents

Within each multinational organization, it was necessary to identify which individuals were in the best position to provide us with the best assessment of the constructs of interest. Given the broad and diverse nature of the concepts we are trying to relate (organizational phenomena and IT infrastructure), we decided to target two senior executives based at the corporate headquarters of the MNC as our respondents.

We decided to collect data on organizational phenomena (industry globalization potential, global strategic orientation, global interdependence and correspondence, and global organizational infrastructure) from a senior executive. In this study, we refer to this executive as the "non-IS" executive (IS stands for information systems).

Of main concern to us was the proper identification of the respondent familiar with the international operations of the MNC. In face of the process of global integration, several MNCs no longer rely on an international division for managing their operations abroad. Therefore, the identification of executives best suited to respond questions about the management of global operations becomes more problematic. To overcome this problem, we targeted as the potential respondent within each MNC in our sample, in order of preference, (a) the executive directly responsible for international operations (VP International or similar), (b) the chief operating officer (COO), or (c) the chief executive officer (CEO).

To identify the executive providing us data on the dimensions of the global IT infrastructure (referred to in this study as the IS executive), we decided to rely on the judgement of the non-IS executive who would be providing us with the organizational aspects of the multinational firm. We requested him/her to identify and forward the

instrument assessing the IT infrastructure to the senior executive administratively responsible for global IT resources in the multinational organization.

This procedure of using multiple respondents as sources of data on independent and dependent variables has advantages and disadvantages. The main advantage is that it collects data from the individuals best informed about constructs of distinct nature. A second advantage of collecting the independent and dependent variables from different sources is that it prevents the respondents from "second-guessing" the research hypotheses and giving inaccurate responses. Making multiple assessments therefore reduces the potential for method bias. Finally, another advantage of selecting two respondents is that it reduces the amount of information coming from a single respondent, and consequently the time spent by the respondent providing his/her assessment.

The principal disadvantage of collecting data on our unit of observation (the multinational organization) from two respondents is the need to enlist the participation for twice as many respondents as might otherwise be necessary. Failure of one of the two respondents to participate in the data collection process has the potential effect of reducing the total number of observations. It was decided, however, that this risk was worth taking in an attempt to gain the benefits of more accurate data.

3.6 Instruments of Measurement

This field survey study uses the questionnaire approach as its primary method for data collection. As it will be shown in the sample size section of this chapter, a relatively large number of units of observations is required to perform the statistical analysis of our hypotheses. Questionnaires therefore seemed to be a more practical and cost effective

approach for data collection than individual interviews. In addition, questionnaires allow for a more objective assessment, reducing the researcher bias in the collection and interpretation of the data.

Given our decision to solicit responses from two senior executives in each multinational organization of our sample, two separate questionnaires had to be developed. *Questionnaire A: The Organizational Assessment* was developed to collect data from the non-IS executive. It included questions assessing the industry globalization potential, global strategic orientation, global interdependence, global correspondence, and global organizational infrastructure. It also included demographic and background items. *Questionnaire B: The Information Technology Assessment* was developed to collect data on the characteristics of the global IT infrastructure of the multinational organization. It was administered to the IS executive administratively responsible for the global IT resources. A copy of these instruments can be found in the Appendix section.

Both instruments were developed using the guidelines provided by Dillman (1978). Through several iterations, the format of both questionnaires was improved so as to pass a positive and professional impression to the respondents. Among the various guidelines adopted by this study in the construction of the instruments are:

- *Front cover:* It contains a title that conveys in a few words the topic of the study and makes it sound interesting. A graphic illustration was placed in the front cover to add interest. It also includes the return address and contact information, the name of the institutional sponsors, a summary of the study, the necessary instructions, and the pledge of confidentiality.

- *Back cover:* It was designed so as to provide space for comments, suggestions, and insights from the respondent. No questions were added to this page.

- *Text format:* Professionally designed so as to motivate completion and look easy to do so. Sections were created to reduce confusion on the part of the respondent, instructions on how to answer the questions were provided, and definitions of potential ambiguous terms were provided before hand to clarify meaning of terms.

- *Instrument format:* The final instruments were assembled as booklets and printed in high-quality white paper.

As part of the design process, both instruments were pre-tested for identification of construction defects and examination of face validity of the several items. The pre-testing procedures are explained in detail in the next chapter, after we discuss the measurement of the several variables.

3.7 Sample Size and Sources

The number of observations upon which an analysis is conducted has important implications for the ability of the researcher to make meaningful interpretations of the results. With an inappropriate number of observations, the researcher runs the risk of committing a Type II error or incorrectly concluding that no effect exists when one does exist. The probability of making such an error is denoted as β. Statistical power, defined as the probability of correctly rejecting a null hypothesis, is computed as being $(1-\beta)$.

Besides the number of observations, several other factors affect statistical power (Cohen 1969). These include α, or the probability of concluding the existence of an effect when one does not really exist, and the effect size. Of these factors, researchers have the

greatest control over sample size. All other factors being constant, increasing the number of observations included in the analysis increases the statistical power of the test.

Statistical power analysis is therefore widely used for determining the number of observations needed for testing hypotheses (Cohen 1969). In this study we use Cohen's procedure (1988) to estimate the number of observations necessary to perform our statistical analysis. For regressions, the procedure uses as inputs the desired level of statistical power (1-β), an estimated effect size (R^2), the desired level of significance (α), and the number of independent variables in the regression model.

Using the conventional value of 0.8 for statistical power and 0.05 for desired level of significance, we can then generate the numbers presented on Table 3.1.

Table 3.1 – Required Number of Observations Based on Statistical Power Analysis

Power (1-β) = 0.8		Effect Size (R^2)		
Significance (α) = 0.05		0.10 (small)	0.15 (medium)	0.20 (large)
Independent Variables	1	71	45	33
	2	88	57	43
	3	101	65	52
	4	111	72	60

Considering a conservative estimate of a small to medium effect size and the inclusion of 3 to 4 independent variables in the regression model, we may therefore conclude that 70 to 100 observations are necessary to perform the statistical analysis. The actual sample size must, however, take into consideration other factors such as response rate for the nature of our study and the method of data collection.

A review of the literature (Pollalis 1994, Kim 1997) showed us that the usable response rate for studies soliciting the assessment of top executives through a mail questionnaire is of about 25%. Given our focus on issues related to international operations, we decided to use the more conservative estimate of 20%. In addition, previous research using two respondents (Teo 1994, Rateb 1992) showed us that 70% of the total number of organizations returning questionnaires were matched. We again decided to take a more conservative approach given the nature of our study and adopted "matching rate" of 50%. In other words, we expected that out of the total number of multinational organizations participating in our study (i.e., returning questionnaires), only in 50% of them both questionnaires A and B would be returned.

We could therefore compute the final sample size by using the following formula (we will assume that the required number of observations is the mean between 70 and 100 or 85):

$$[\text{Number of Observations}] = [\text{Sample Size}] \times [\text{Response Rate}] \times [\text{Matching Rate}]$$
$$85 = [\text{Sample Size}] \times 0.20 \times 0.50$$
$$[\text{Sample Size}] = 850$$

To select the multinational organizations we decided to use the World Wide Web based directory *Hoovers Online* (www.hoovers.com). Since data in the Hoovers database is updated on a regular basis, we thought that this choice would provide us with the most accurate and up-to-date information. In addition, an electronic directory such as *Hoovers Online* would also facilitate the construction of our sample database. All necessary information could be readily cut and pasted into the fields of our own sample database.

The *Hoovers Online* directory maintains information on over 12,000 firms. Each entry in the database contains the company's description, address, names of top executives, competitors, and data on sales, number of employees, growth rates, etc. The company description also indicates the number and location of foreign affiliates (if any).

A total of 904 multinational organizations were randomly selected from the directory. For selecting the firms we first listed them according to their primary industry and, within the industry, we randomly selected firms out of the list. If the selected firm matched our previously described criteria (US based with more than two national units), its information was transferred to a Microsoft Access database created for this study.

3.8 Pilot Study

A pilot study was conducted prior to collecting data from the whole sample to identify problems with the research design. Through the pilot study we were able to identify potential problems with the instruments developed that were not detected in the pre-testing phase. In addition, it would also point out to us the problems and the critical factors in the data collection procedures.

For the pilot study we randomly selected 100 multinational firms out of our sample of 904 firms. We used the systematic sample procedure for selecting the organizations, including every 9th firm of our sample list into the pilot list. In the following sections we describe the procedures utilized in the pilot study for data collection.

3.8.1 Pilot Study Data Collection Procedures

The data collection procedure for the pilot study consisted of an initial mailing of the questionnaires, followed by the mailing of a reminder card to the whole sample, and a second mailing of questionnaires to non-respondents. This procedure follows the guidelines provided by Dillman (1978) and recommended by Fowler (1993). Details of each step in the data collection procedure are provided below.

Initial Mailing

The initial mailing, addressed to the non-IS executive, contained a cover letter to the non-IS executive, a cover letter to the IS executive, a copy of each questionnaire. It also included two "Business Reply Mail" envelopes for the mailing back of the questionnaires.

The cover letter to the non-IS executive was personally addressed. It first introduced the study and its importance, explained why we were soliciting his/her participation, and requested him/her to fill in Questionnaire A and to forward Questionnaire B to the executive administratively responsible for the global IT resources. It also included the pledge of confidentiality and offered to provide a customized executive report of the results, comparing the organization to the aggregate results of the participating firms. Finally, it provided our telephone number for an eventual contact with the researchers.

The cover letter to the IS executive was similar in content to the letter to the non-IS executive. Since we did not know to whom this letter should be addressed, it could not be personally addressed. Instead, a few address lines and a text box were provided so that the non-IS executive could write the address and a forwarding note. The letter explained

the study in a similar way it was explained to the non-IS executive and requested the respondent to fill in Questionnaire B.

To facilitate the task of forwarding the material to the IS executive, the reply envelope and cover letter to the IS executive were attached to Questionnaire B using paper clips. A small card requesting that the material be forwarded to the IS executive was also attached.

A control number was written in each questionnaire to help us match responses and maintain the sample database. Through the control number the researchers could monitor what companies and what individuals were providing responses and react accordingly in the second mailing.

Reminder Card

About two weeks after the initial mailing, a reminder card was sent to all multinational organizations included in the pilot study. The reminder card was also addressed to the non-IS executive. It basically served two purposes: (a) as a "thank you" for those who had responded and (b) as a reminder for those who have not.

The reminder card reiterated the importance of the response for the success of the study and invited the respondent to call us in case he/she needed a replacement questionnaire. In addition, the reminder card also asked the non-IS executive to contact the IS executive and verify whether he/she had already returned Questionnaire B.

Second Mailing:

About a month after the initial mailing of the pilot study, a second mailing was sent to all the non-respondents. Since we had already received some responses back, the

second mailing had to properly address partial responses (i.e., when either Questionnaire

A or B were returned) and no responses (i.e., when neither Questionnaire A nor B were

returned). Several "cases" of non-response were identified. These "cases" differ in terms

of:

- *The type of questionnaire returned.*

- *The availability of the IS executive name*: The non-IS executive was given the option

  of providing the name of the IS executive to whom Questionnaire B was forwarded at

  the end of Questionnaire A.

- *The indication by the non-IS executive of his/her desire of receiving the final report:*

  To receive the final report, the executive had to identify himself/herself at the end of

  Questionnaire A.

Suitable actions were taken to address each of the possible different cases of non-

responses. The appropriate cover letters were produced (please refer to the Appendix

Section for a copy of these cover letters) and new copies of the instruments not yet

returned were added to the mailing.

3.8.2 Lessons Learned and Improvements to Data Collection Procedures

A few issues were raised during the data collection process of the pilot study.

Since the main purpose of the pilot study is the detection of such issues, we may say that

the pilot study was indeed very helpful in providing a means of enhancing the data

collection procedures. We now turn to the problems encountered and how we intend to

address them for the main study.

Several Questionnaires A were returned without a request for the final report (which, in practical terms means the self-identification of the respondent), and without the name of the IS executive to whom Questionnaire B had been forwarded. The lack of this information had to be assumed as an attempt to anonymity on the part of the non-IS executive.

Although anonymity was not pledged at any time, the cover letter of the initial mailing failed to mention that the control number in each questionnaire was going to be used for follow-ups on non-responses. Consequently, we could not contact the non-IS executive again to inform that Questionnaire B was not received and request him/her to forward Questionnaire B one more time to the IS executive.

To overcome this problem, we decided to take two actions:

- We modified the cover letters and included a statement explaining the follow-up purpose of the control number. This statement would later on allow us to maintain contact with the non-IS executive. The cover letters available in the appendices already incorporate this change.

- We decided to include a postage paid card in the initial mailing and request the non-IS executive to provide the name and address of the IS executive to whom Questionnaire B was forwarded in that card. By removing this information from Questionnaire A we made this request more visible and increased the chances of getting information on the IS executive receiving Questionnaire B. This also avoided the problem of the respondent of Questionnaire A not providing the information on the IS executive simply because he/she did not know to whom Questionnaire B was

forwarded (in case Questionnaire A is also forwarded to somebody else by the non-IS executive).

The response rate obtained in the pilot study was partially below the expected. As shown on Table 3.2, while the number of participating MNCs was below the expected, the matching rate was better than our expectations.

Table 3.2 – Pilot Study Response Rate

	Expected		Obtained	
	Number	Percent	Number	Percent
MNCs Responding	20	20%	11	11%
Matching Responses	10	50%	7	64%

Several issues were raised to help us understand the lower than expected response rate. The first of them is related to the appropriateness of the timing between mailings. For the pilot study we used a 15-day interval between mailings because we thought that it would take some time for the questionnaires to reach the appropriate respondent and for the respondents to answer and return the questionnaires. However, recent studies (Kim 1997) have found that unless the questionnaires are returned within a week after they are received, most probably they end up being discarded. Dillman (1978) recommends a 10-day interval between mailings. These shorter intervals tend to increase the intensity of exposure of the respondent to the study, increasing the chances of participation. Although we were still not sure about the appropriateness of this time frame for the second mailing, we certainly believed that the reminder card could be sent earlier, about a week after the

initial mailing. However, we decided to maintain a two-week interval between the mailing of the reminder card and the second mailing.

As explained before, we were unable to contact again firms that submitted a single questionnaire without requesting the final report since we failed to mention in the cover letter that the control number was going to be used for follow ups. In other words, we could not pro-actively try to match non-matching responses. The data collection process for the main study fixed the problem, allowing us to make use of phone calls to enlist participation of the respondents. Phone calls can help reinforce the importance of the study and obtain agreement from the target respondents to participate in the study (Dillman 1978).

We made phone calls right after the initial and the second mailings to (a) inform and call the attention of the respondent to the mailing containing our questionnaires and (b) get information on the IS respondent. Kim (1997) found that phone calls to be a useful procedure, even though the number of actual respondents reached through the call was low (10-15%).

Another issue that might have affected the response rate was the possibility of both questionnaires being forwarded to the IS executive. Since the study is being labeled as primarily concerned with information technology issues, the non-IS executive might have forwarded both questionnaires to the IS executive, since he/she is one that getting most of the benefits of participating in the study. However, answering both questionnaires become too much of a burden and the IS executive might have decided that it was not worth the time to be spent answering both questionnaires. Although there

was not much that could be done to resolve this issue, we reviewed the cover letters so as to stress the importance of the study for both respondents.

Finally, a third mailing of the questionnaires was included to the main study data collection so as guarantee the desired number of observations. The third mailing was conducted in several ways, depending on the type of information that we had on the potential respondents:

- Mailing addressed to the non-IS executive, just like in the previous mailings.

- Mailing addressed to the IS executive and asking him/her to forward Questionnaire A to non-IS executive. This procedure was used for those cases where through the phone calls we were informed that both questionnaires were mailed to the IS executive.

- Mailing addressing Questionnaire A to the non-IS executive and Questionnaire B to the IS executive separately, when through phone calls information on both respondents was received.

- Mailing addressed to the remaining respondent, once one of the questionnaires had already been received and information was available on the remaining respondent.

These actions helped us improve the response rate and obtain the necessary number of observations. Figure 3.1 depicts graphically the data collection procedures for pilot study and the changes implemented for the main study.

MAIN STUDY

Day 1	Day 10	Day 24	Day 45

| Initial Mailing | Reminder Card | Second Mailing | Third Mailing* |

| Phone Calls* | | Phone Calls* |

Day 1	Day 14	Day 32

*: Not included in Pilot Study

PILOT STUDY
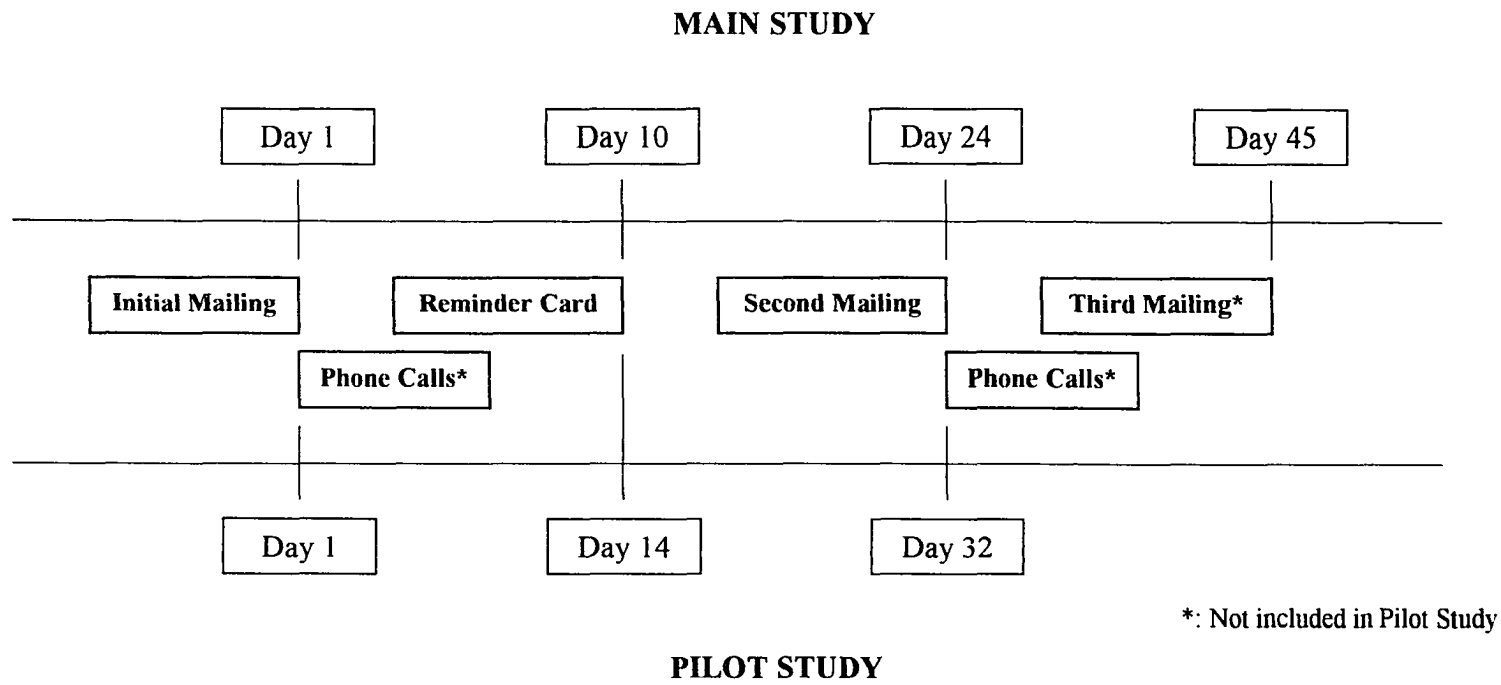
Figure 3.1 – Data Collection Procedure and Time Frame

3.9 *Operationalization and Measurement of Variables*

This section presents operationalization for the constructs and dimensions of industry globalization potential, global strategic orientation, global interdependence, global correspondence, global organizational infrastructure, and global IT infrastructure.

Although it might be desirable to develop "objective" operationalizations for the constructs of interest, this study will focus primarily on the perceptions of top executives from the participating multinational organizations. One could argue that managerial decisions and actions are based on perceptions and not necessarily the "reality" of the situation. Managers perceive their internal and external environments and make decisions based on these perceptions.

In trying to operationalize the constructs, all efforts were made to utilize measures used in past empirical research. Where no validated measures were available, the questionnaire items were derived from suggestions and reviews of the relevant conceptual literature. In adapting and building the instrument items, we followed the several guidelines provided in the literature (Converse and Presser 1986, Fowler 1993, Venkatraman and Grant 1986).

The majority of the questionnaire items were measured using Likert type scales. In developing the scales, we tried to keep the number of scale references to a minimal, so as not to cause confusion to the respondents. These reference scale types are shown in Table 3.3.

Table 3.3 – Scale References for Questionnaires A and B

7-Item Likert Scale – Type A

Strongly Disagree	Disagree	Somewhat disagree	No opinion	Somewhat Agree	Agree	Strongly Agree
1	2	3	4	5	6	7

7-Item Likert Scale – Type B

Every six Months Or longer	Once a Quarter	Once a month	Every two weeks	Once a Week	Every three days	Once a day or less
1	2	3	4	5	6	7

7-Item Likert Scale – Type C

Six Months Or longer	One Quarter	One month	Two weeks	One Week	Three days	One day or less
1	2	3	4	5	6	7

5-Item Likert Scale

Not at all	To some extent	Moderately	To a great extent	Extremely
1	2	3	4	5

3.9.1 Measures of Industry Globalization Potential

Table 3.4 lists the several items developed to measure the identified dimensions of industry globalization potential. Measures for these dimensions were either adapted directly from items previously developed (Birkinshaw et al 1995, Johansson and Yip 1994) or developed from suggestions provided by related work (Yip 1992, Kobrin 1991). All items were measured using a 7-item Likert scale (type A). Since a multinational organization can have diversified operations, the question to assess industry globalization potential asked the respondent to provide his/her assessment about the primary industry where the MNC operates.

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Table 3.4 – Measures of Industry Globalization Potential

Wording	Location	Measure
Comparative advantages	Q A / S 1	
Wages vary significantly across countries	I 5	7-Item Likert
• The availability of relevant skills varies across countries	I 7	Type A
• Interest rates differ substantially across countries	I 8	
Economies of scale	Q A / S 1	
• Selling products globally reduces unit production cost	I 1	7-Item Likert
• Operating at an efficient scale requires foreign expansion	I 4	Type A
• International operations are economically attractive	I 10	
Market homogenization	Q A / S 1	
• Customers have common purchasing habits worldwide	I 6	7-Item Likert
• Needs for products and services are similar worldwide	I 9	Type A
• Similar expectations about products exist worldwide	I 12	
Technological intensity	Q A / S 1	
• The rate of product innovation requires high R&D budgets	I 2	7-Item Likert
• Production process technologies are frequently updated	I 3	Type A
• Products must be constantly enhanced and improved	I 11	

Q: Questionnaire. S: Section. I: Item

3.9.2 Measures of Global Strategic Orientation

Table 3.5 depicts our measures for the dimensions of global strategic orientation.

The measures were either adapted from the measures developed by Yip and Johansson

(1994), Martinez and Jarillo (1991) and Morrison (1990) or developed from suggestions

and conceptualizations provided in the literature (Yip 1992, Kogut and Kulatilaka 1994).

They all use a 7-item Likert scale of type A.

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Table 3.5 – Measures of Global Strategic Orientation

Wording	Location	Measure
Marketing approach	Q A / S 2	
• Your multinational organization seeks standardization of products across national units as much as possible	I 2	7-Item Likert Type A
• National units use similar marketing approaches	I 15	
• Your multinational organization seeks customization of products across national markets as much as possible *(reverse coding)*	I 12	
Operational flexibility	Q A / S 2	
• Response to fluctuations in exchange rates usually involves actions in multiple national units	I 6	7-Item Likert Type A
• Response to changes in government policies usually involves actions in multiple national units	I 11	
• Operational flexibility is achieved by the concurrent adaptation of multiple national units to uncertain events	I 14	
National unit role	Q A / S 2	
• National units are assigned different strategic roles based on their unique strengths and competencies	I 3	7-Item Likert Type A
• The national units' strengths are leveraged globally	I 8	
• National units operating in markets offering unique advantages are assigned distinctive strategic roles	I 9	
Market participation	Q A / S 2	
• The stand-alone contribution to revenues and profits of a market is the primary criterion for investment decisions *(reverse coding)*	I 1	7-Item Likert Type A
• Investments in national markets are primarily based on their contribution to the organization's global positioning	I 4	
• National markets are chosen based on their potential to enhance the global competitiveness of your organization	I 10	
Competitive moves	Q A / S 2	
• Competitive actions taken by your organization usually involve the participation of three or more national units	I 7	7-Item Likert Type A
• The response to a competitive attack in one national market involves the concerted action of multiple units	I 13	
• The national units pursue independent strategies (reverse coding)	I 5	

Q: Questionnaire. S: Section. I: Item

3.9.3 Measures of Global Interdependence

We defined global interdependence as the extent to which the operations of the multinational organization are contingent upon the interaction among national units. The increased level of interaction and unit interdependence may be captured by the patterns of resource exchange established among units of the MNC. More interdependent

relationships among units of the MNC will involve more intense flow of resources within the MNC (Kobrin 1991). Therefore, the characteristics and levels of resource exchange among units of the MNC provide a means of assessing the levels of global interdependence.

McCann and Ferry (1979) proposed several dimensions characterizing the exchange of resources among organizational units as an operationalization of interdependence. These include the number of different resources exchanged, the amount, the importance, the frequency, the level of slack resources (a "buffer" to interdependence), and the direction of resource exchanges. In a direct application of McCann and Ferry's suggestions, Wybo (1992) developed questionnaire items intended to measure unit interdependence. We mainly adapted Wybo's operationalization to the MNC context. In doing so, we used the following operational definitions for the dimensions suggested by McCann and Ferry:

- The *number* of different resource exchanges among units of the MNC. Besides the flow of components and final products within the MNC (Porter 1986, Bartlett and Ghoshal 1989, Kobrin 1991), internal flows of people, information, and values are also important indicatives of the levels of interaction among units of the MNC (Ghoshal 1987, Gupta and Govindarajan 1991). We assessed global interdependence for the flows of physical, human, financial, and information resources. Each one of these resources was defined to the respondents as follows:

  PHYSICAL ASSETS: Work and production related objects such as raw materials, work-in-progress, components and parts, finished products, prototypes, supplies, promotion material, etc.

> **INFORMATION:** Forms, memos, reports, messages, drawings, orders, minutes of meetings, files, and data sets both in paper and/or electronic format. Computer and paper-based files with organizational data are information; not physical assets.
>
> **HUMAN RESOURCES:** The people employed by all national units of the multinational organization.
>
> **FINANCIAL RESOURCES:** Any form of capital and monetary funds available for the national units of your multinational organization.

- The *amount* of resource exchanges among units of the MNC. We captured this dimension by assessing the extent of each resource exchange among units of the MNC. Our assumption was that a greater extent in the exchange of resources characterizes greater amounts of resources being exchanged among national units.

- The *frequency* of resource exchanges among units of the MNC. We captured this dimension by assessing whether the exchange of each resource type among units of the MNC is perennial or sporadic. More frequent exchange of resources indicates a higher level of global interdependence among units of the MNC.

- The *level of slack resources* in the several units of the MNC. Nohria and Gulati (1996) define slack as "the pool of resources within an organization that is in excess of the minimum necessary to produce a given level of organizational output." Galbraith (1973) suggested that organizations might increase their levels of slack resources to cope with increased levels of organizational complexity. Although the level of slack resources by itself does not characterize interdependence, its presence indicates a lower level of interdependence. A higher level of slack resources buffers organizations from the uncertainties associated with the flow of resources (Pfeffer

and Salancik 1978). For measuring this dimension, we used both an item developed by Wybo (1992) as well as an item developed by Nohria and Gulati (1996).

- The *importance* of the resource exchanges to the MNC. We captured this dimension by assessing the extent to which the several units of the MNC depend on the internal flow of resources for their operation. Some units of the MNC might have alternative sources, such as external suppliers, that reduce the impact of the loss of internal resource flows. In this case, the units are less dependent on the internal flow of resources and, therefore, the overall levels of global interdependence would be expected to be lower.

Based on the above definitions for the MNC context, we adapted the items developed by Wybo (1992). In addition, for the levels of slack resources, we also used an item developed by Nohria and Gulatti (1996). All measures utilized Likert type scales. Table 3.6 depicts the measures for the several dimensions of Global Interdependence.

Table 3.6 – Measures of Global Interdependence

Wording	Location	Measure
Amount or Extent of resource exchange	Q A / S 3	
• To what extent are the following resources exchanged among national units? [Physical, Information, Human, Financial]	Q1	5-Item Likert
Importance of resource exchange	Q A / S 3	
• How important is the exchange of the following resources among national units? [Physical, Information, Human, Financial]	Q2	5-Item Likert
• How dependent are national units on one another for the following resources? [Physical, Information, Human, Financial]	Q A / S 3 Q3	
Frequency of resource exchange	Q A / S 3	7-Item Likert Type B
• How frequently do the national units exchange the following resources? [Physical, Information, Human, Financial]	Q5	
Level of slack resources	Q A / S 3	
• How difficult would it be for national units to expand operations without significant transfer of these resources from other national units? [Physical, Information, Human, Financial]	Q4	5-Item Likert
• How delayed can the exchange of following resources among the national units be before the operations of your organization are negatively affected? [Physical, Information, Human, Financial]	Q6	7-Item Likert Type C

3.9.4 Measures of Global Correspondence

Global correspondence was defined as the level of agreement among national units with respect to the overall goals, objectives, and priorities of the MNC. The dimensions used to measure correspondence were:

• Level of agreement among national units

• The extent of compliance of national units with strategic decisions of the MNC

• The extent of conflict between local and global objectives

These measures were developed based on suggestions from the literature. The measures developed for the construct of global correspondence are depicted on Table 3.7. They all utilize a 7-Item Likert scale of type A.

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Table 3.7 – Measures of Global Correspondence

Wording	Location	Scale
Level of agreement among national units	Q A / S 4	
• National units disagree over the ways operations are managed by the multinational organization *(reverse coding)*	I 3	
• National units agree over the human resources practices of the multinational organization	I 4	
• National units agree over the scheduling of activities across the multinational organization	I 7	Likert (1-7) Type A
• National units agree over the goals and objectives of the multinational organization	I 9	
• National units disagree over the allocation of resources across the multinational organization *(reverse coding)*	I 11	
Conflict between local and global objectives	Q A / S 4	
• Conflict of interests exist among national units *(reverse coding)*	I 2	
• Priorities set by the national units are congruent with the goals of the multinational organization	I 6	Likert (1-7) Type A
• Goals of the national units for their local markets are in conflict with those of the multinational organization *(reverse coding)*	I 12	
Compliance of national units	Q A / S 4	
• National units tend to disregard the strategic decisions made by the multinational organization *(reverse coding)*	I 1	
• National units' actions are consonant with executing the global strategy set forth by the multinational organization	I 5	Likert (1-7) Type A
• National units follow global marketing recommendations made by the multinational organization	I 8	
• National units accept and implement the operational resolutions made by the multinational organization	I 10	

3.9.5 Global Organizational Infrastructure

Measures for both the vertical and lateral coordination mechanisms of the global organizational infrastructure were adapted from instruments previously developed by Martinez and Jarillo (1991), Ghoshal and Nohria (1989), Jaworski et al (1993), Prahalad and Doz (1981) and suggestions provided by Yip (1992). All items utilize a 7-Item Likert scale of type A. The several items are depicted on Table 3.8 and Table 3.9.

Table 3.8 – Measures of Global Org. Infrastructure – Vertical Coordination Mechanisms

Wording	Location	Scale
Centralization	Q A / S 4	
• Decisions regarding the strategies and operations of national units are made at the corporate headquarters	I 6	
• In general, national units enjoy autonomy for deciding their strategies and operating policies *(reverse coding)*	I 11	Likert (1-7) Type A
• National units maintain discretion over their operations and the scheduling of their activities *(reverse coding)*	I 14	
Formalization	Q A / S 4	
• A fairly well defined set of rules and policies is available for the activities of the national units	I 3	
• National units are provided with procedures that define the course of action to be taken under different situations	I 8	Likert (1-7) Type A
• Policies and rules governing the activities of the national units are formalized through instruments such as manuals, standing operating procedures, etc.	I 19	
Output control	Q A / S 4	
• If the national units' performance goals are not met, they are required to explain why	I 1	
• Specific performance goals are established for the activities of the national units	I 4	Likert (1-7) Type A
• The corporate headquarters monitors the extent to which the national units' attain their performance goals	I 20	
Behavioral control	Q A / S 4	
• The corporate headquarters evaluates the procedures used by the national units to accomplish a given task	I 7	
• The corporate headquarters monitors the extent to which the national units follow established procedures	I 9	Likert (1-7) Type A
• The corporate headquarters modifies the national units' procedures when desired results are not obtained	I 10	

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Table 3.9 – Measures of the Global Org. Infrastructure – Lateral Coordination Mechanisms

Wording	Location	Scale
Lateral relations	Q A / S 4	
• Formal meetings are regularly scheduled for discussion of problems common to multiple national units	I 2	
• Inter-unit teams and committees coordinate activities common to multiple national units	I 5	Likert (1-7) Type A
• Your multinational organization makes use of task forces to facilitate collaboration among the national units	I 15	
Informal communication	Q A / S 4	
• Corporate meetings and gatherings aimed at increasing contact among national units' managers are sponsored by your multinational organization	I 13	
• In general, managers across national units maintain personal informal contacts with each other	I 16	Likert (1-7) Type A
• Informal meetings are held to facilitate the interaction among managers of the national units	I 17	
Socialization	Q A / S 4	
• Rewards systems are similar across national units	I 12	
• Your multinational organization maintains worldwide training programs for managers of the national units	I 18	Likert (1-7) Type A
• Managers across national units are provided with well-defined and common career paths	I 21	

3.9.6 Global IT Infrastructure

Global IT infrastructure was defined as the computer-related capabilities developed by the MNC for the management of its worldwide operations. The capabilities of the global IT infrastructure may be assessed along several dimensions that are relevant to the context of multinational corporations (Gibson 1992, Sethi 1992, Jarvenpaa and Ives 1993, Broadbent and Butler 1997, Broadbent 1997). These include the reach and range of the global IT infrastructure (Keen 1991, Keen and Cummins 1994, Broadbent et at 1996), the extent of support services provided to the development and maintenance of the Global IT Infrastructure (Gibson 1992, Duncan 1995, Broadbent et al 1996), and the extent of planning for the development and deployment of the IT infrastructure (Duncan 1995).

Range was defined as the level of functionality provided by the global IT infrastructure to the implementation of applications spanning multiple units of the MNC. It refers to the level of support provided by the global IT infrastructure to the sharing and reusability of IT resources across national units of the MNC (Broadbent et al 1996). Range was therefore measured by asking respondents to assess the levels of platform interoperability, network connectivity, and data transparency present in the global IT infrastructure. Items were developed and adapted from suggestions in the literature (Keen 1991, Duncan 1995, Broadbent and Weill 1997). These are depicted on Table 3.10.

Table 3.10 – Measures of Global IT Infrastructure: Range

Wording	Location	Scale
Network connectivity	Q B / S 3	
• Communications across national units rely primarily on electronic messaging systems	I 1	
• The network/telecommunication infrastructure allows multiple national units to transmit all types of data (text, graphics and audio) electronically	I 6	
• The exchange of operational data across national units relies primarily on the use of electronic data interchange and related technologies	I 9	Likert (1-7) Type A
• The network/telecommunication infrastructure is capable of carrying high bandwidth applications across national units	I 13	
• The network/telecommunication infrastructure allows multiple national units to hold electronic meetings	I 19	
Platform interoperability	Q B / S 2	
• National units with different computer platforms are provided with bridging mechanisms to allow processing of shared transactions	I 16	
• National units have similar hardware and operating systems configurations	I 2	
• Applications developed at a national unit may be transferred to computer platforms of other units without major modifications	I 3	Likert (1-7) Type A
• Computer platforms used for critical shared tasks across national units are compatible	I 11	
• Applications used for critical shared tasks can be readily migrated across computer platforms of national units	I 18	
Data transparency	Q B / S 2	
• National units maintain local databases with identical, replicated data elements and standard record structures	I 7	
• Data mapping or translation must occur when data elements are transferred across national units	I 12	
• Your multinational organization utilizes shared databases for data relevant to multiple national units	I 15	Likert (1-7) Type A
• Databases maintained by the national units make use of standard record structures	I 17	
• Databases at national units make use of data definitions standardized across the multinational organization	I 20	

Reach was defined as the extent to which the capabilities of global IT infrastructure are available to the several units of the MNC. This dimension captures the number of locations across the MNC that can share and make use of the IT infrastructure (Broadbent et al 1996).

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Reach was measured by asking respondents to indicate the number of national units provided with different capabilities of the global IT infrastructure. Since asking the exact number of units would place an unnecessary burden on the respondent and providing a 5 or 7 item scale would create situations of ambiguity for respondents of MNCs with few national units, we decided to adopt a 3-item scale. The options required the respondent to evaluate whether the IT capability was available only "within a unit," "across many units," and "across all units." The respondent was also provided with a "not applicable" option.

An index for the reach of each capability of the global IT infrastructure will be computed in the following manner:

(a) A score will be associated for each of three options (1=within national unit, 2=across many units, 3=across all units);

(b) The scores for the items of each capability (networks, platforms, data) will be added;

(c) The sum will be divided by the total number of items listed for the capability subtracted by the number of items marked as "not applicable."

Table 3.11 depicts the items used to assess the reach of each capability comprising the Global IT Infrastructure.

Table 3.11 – Measures of Global IT Infrastructure: Reach

Wording	Location	Scale
Network connectivity	Q B / S 2	
• Electronic meetings using videoconferencing technologies	I 2	
• Electronic data interchange (EDI) and related technologies	I 5	
• Electronic messaging	I 7	
Platform interoperability	Q B / S 2	
• Standard and/or compatible hardware	I 10	
• Standard operating systems	I 11	
• Mechanisms to bridge different computer platforms	I 12	
Data transparency	Q B / S 2	
• Databases with standard record structures	I 4	
• Databases with standard field definitions	I 6	
• Mechanisms for data mapping and/or translation	I 8	
• Shared databases	I 9	

Planning was defined as the level of planning currently in place for the development and expansion of the global IT infrastructure. This dimension captures the extent to which the development of the global IT infrastructure across the MNC is governed by a master plan. As suggested by Broadbent et al (1996), the human element of the IT infrastructure is responsible for establishing plans that guarantee a consistent and reliable set of capabilities provided by the IT infrastructure. This dimension also captures the rules and standards governing the development of global IT resources across national units of the MNC.

We developed measures to assess the planning across the capabilities of the global IT infrastructure: network connectivity, platform interoperability, and data transparency. Table 3.12 depicts the items developed. They all make use of a 7-Item Likert type A scale.

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Table 3.12 – Measures of Global IT Infrastructure: Planning

Wording	Location	Scale
Network connectivity	Q B / S 5	
• The overall connectivity of mainframes/workstations/PCs across national units	I 3	
• The development of networks for handling electronic transmission and distribution of data across units	I 4	Likert (1-7) Type A
• The development of networks for handling multimedia communication across national units	I 8	
• The selection and use of network and/or telecommunication protocols by the national units	I 10	
Platform interoperability	Q B / S 5	
• Standardization of operating systems across units	I 2	
• Compatibility of hardware across national units	I 7	Likert (1-7) Type A
• Standardization of hardware across national units	I 12	
• Compatibility of operating systems across national units	I 16	
Data transparency	Q B / S 5	
• Standardization of record structures across units	I 6	
• The development of centralized databases for storage of data elements shared by multiple national units	I 9	
• The development of standard field definitions for data elements shared by multiple national units	I 11	Likert (1-7) Type A
• The development of mechanisms to translate and/or map data elements across national units	I 14	

Support Services refers to the level of support provided by the corporate IS group to the use and operation of global IT infrastructure. In a study of the patterns of IT infrastructure capabilities, Broadbent et al (1996), identified 23 firm wide IT infrastructure services managed by the corporate IS group in each firm. Five of these services were identified as core since they were prevalent in all firms that had firm wide IT infrastructure services.

We used this list to develop our measure of the level of support present in the global IT infrastructure. We were interested in measuring the availability and the level of support across the MNC for the development and maintenance of a set of sharable and reusable IT resources. As Broadbent et al (1996) suggests, a high number of services

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being provided by the corporate IS group indicates a high level of IT infrastructure capability. Our measure therefore asked the respondents to indicate the responsibility of the corporate IS group for providing the several IT infrastructure services listed. Our scale consisted of three options: "no responsibility," "shared responsibility with national unit," and "major/full responsibility."

An index for the levels of primary and secondary services being provided by the corporate IS group was computed in similar way to the reach scores. Specifically, we:

(a) Associated a score to each of services listed using the appropriate scale (2=shared responsibility with national units, 3=major/full responsibility).

(b) Added the scores according to their memberships to the categories of primary or secondary services.

(c) Divided the sum by the total number of services listed for each category subtracted by the number of services marked as "no responsibility."

Table 3.13 – Measures of Global IT Infrastructure: Infrastructure Services

Wording	Location	Scale
Primary		
• Management of corporate communication network services		
• Management of organization-wide messaging services	Q B / S 4	Likert (1-7)
• Recommend standards for the components of the IT infrastructure	I 1-5	Type A
• Security, disaster planning and business recovery for applications and installations		
• Technology advice and support services		
Secondary		
• Management, maintenance, and support of large-scale data processing facilities		
• Management of organization-wide applications and databases		
• Management of IS projects involving multiple national units		
• Data management advice and consulting services		
• Providing IS planning for national units		
• Enforcement of standards for the IT infrastructure components		
• Management of national unit specific networks		
• Managing and negotiating with organization-wide suppliers and outsourcers		
• Identification and testing of new technologies for use of the national units	Q B / S 4	Likert (1-7)
• Development of national unit specific applications	I 6-23	Type A
• Implementation of security, disaster planning and recovery for national units		
• Electronic provision of management information on national units' activities		
• Maintenance of national unit specific applications		
• Development of standard record structures and standard field definitions		
• Development and management of on-line and EDI linkages among national units		
• Development of a common systems development environment		
• Technology training and education services		
• Multimedia operations and development (e.g., videoconferencing)		

3.10 Instrument Pre-testing

Pre-testing of instruments is carried out for the purpose of identifying

construction defects and to examine the face validity of the several instrument items. The

pre-testing phase ensures that (Dillman 1978):

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- Each of the items is measuring what it is intended to measure.

- All the words and sentences are understood.

- Each close-ended question has an answer that applies to each respondent.

- Questions are provided with correct options for answer.

- No aspect of the questionnaires suggests bias on the part of the researcher.

- The questionnaires create a positive impression, one that motivates response.

- The approximate time answering the questionnaires in their entirety.

A series of pre-tests was conducted with executives of the Pittsburgh area familiar with the contents of the questionnaires, practitioners enrolled in the Katz School's Executive MBA program, faculty members and doctoral students of the Katz Graduate School of Business.

The majority of EMBA students and the executives of the Pittsburgh area were observed while completing the questionnaire. Respondents were asked to point out problems with the clarity or meaning of questions and to provide general comments regarding the topic and the length of the instrument. The comments and suggestions were recorded and used to further improve the questionnaire.

All other participants of the pre-testing phase (faculty and doctoral students) were provided with a set of instructions on how to pre-test the instrument and a summary of the research objectives, the construct definitions, and the hypothesized relationships. A copy of the cover letter with the set of instructions can be found in the Appendix section. Most questionnaires were returned back by these individuals with comments and suggestions for improvement. Time taken to review the instruments was recorded and an

average was taken to establish that approximately 20 minutes were necessary to fill in each questionnaire.

After all comments were returned, both questionnaires were reviewed and a final version of each was constructed for the pilot study. The final versions of Questionnaire A and Questionnaire B are presented in the Appendix section.

CHAPTER 4

Validity and Reliability Analysis

4.1 Introduction

Theoretical propositions are statements of relationships between unobservable variables or constructs. Empirical tests of theoretical propositions are tests of the relationships between observable variables. For these empirical tests to be meaningful, observable variables must (a) correspond to the unobservable theoretical constructs of interest, and (b) be measured in ways that minimize error. In addition, the sample used for the empirical tests must be representative of the population from which we want to make inferences.

Validity captures the degree to which an instrument measures the underlying construct (Kerlinger 1973). The goal of construct validation is "getting one's operations to reflect one's research constructs" (Cook and Campbell 1979, p. 64). This is achieved first by the "careful pre-experimental explication of constructs so that definitions are clear and in conformity with the public understanding of the words being used" (Cook 1979, p. 60). The second step is then ensuring that convergence across different measures or manipulations of the same construct can be achieved. In this study, both content and construct validity were assessed for the several measures. In this chapter we review the steps taken to guarantee content validity and make an assessment of construct validity using factor analysis.

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Reliability assesses the stability of the instruments and consistency of the measures (Kerlinger 1973, Nunnally 1978). In this chapter we also discuss the reliability of the various constructs are discussed. We make an assessment of the reliability of each construct using the Cronbach's Alpha coefficient, which captures the internal consistency of the related measures.

In this chapter, we first describe the sample obtained through our data collection process and make an assessment of its characteristics against the guidelines set by our research design. We then proceed with the validity and reliability analyses of the instruments used for data collection.

4.2   Sample Analysis

4.2.1   Response Rate

In total, 224 questionnaires were received. Responses totaled 109 for Questionnaire A and 115 for Questionnaire B. The total number of participating firms was 130. We received both Questionnaires A and B from 94 of these firms.

Table 4.1 compares the expected and actual levels of response. Although the percentage of MNCs submitting responses (16%) was below the expected 20%, the percentage of matching responses (72.6%) turned out to be 50% higher than the expected (50%), leading to a final response rate of 11.7%, higher than the expected 10%.

The breakdown of responses to Questionnaires A and B is summarized in Table 4.2. All returned surveys were screened for their completeness and usefulness. We were able to include all responses in the study. No patterns of mistakes or careless responses were identified, indicating that the pre-testing and pilot testing of the instruments were effective in adjusting the instrument design.

Out of the total sample, 210 multinational organizations declined participation in the study either by sending us a letter or over the phone, when the courtesy call was placed to encourage the submission of responses. The main reasons cited for declining participation included:

- *Company policy*: Due to the large number of surveys received over time, many companies have adopted a policy of not responding to surveys;

- *Too many requests*: Although a company policy is not in place, many executives declined participation due to the large number of surveys received over time;

- *Lack of time and resources:* The company/executive could not respond the survey due to high workload;

- *Lack of interest:* The survey topic was not of interest to the executive;

- *Restructuring of the organization:* Some companies were undergoing reorganization and therefore could not provide us with insights on their current state;

- *Lack of fit between study and organization:* A few executives felt that the questionnaire did not fit the structure of the organization.

Table 4.1 – Response Rate by MNCs- Expected and Actual Levels

	Expected		Actual	
	Count	Percent	Count	Percent
Sample Size	804	100%	804	100%
MNCs Responding	160	20%	130	16%
Matching Responses	80	50%	94	73%

The total response rate (matched plus unmatched) for each questionnaire was computed using the formula recommended by Dillman (1978). This formula excludes from the denominator the unusable and undeliverable surveys. For Questionnaire A, the adjusted response rate is 14.0% while for Questionnaire B it is 14.8%. Given the characteristics of the study (addressed to senior executives, international focus, etc.), we considered the response rate satisfactory.

Table 4.2 – Breakdown of Responses by Questionnaire Type

	Questionnaire A		Questionnaire B	
	Count	Percent	Count	Percent
Matching responses	94	11.7%	94	11.7%
Non-matching responses	15	1.9%	21	2.6%
Unusable responses	0	0.0%	0	0.0%
Non-responses	457	56.8%	451	56.1%
Declined participation *, **	210	26.1%	210	26.1%
Returned mailing*	28	3.5%	28	3.5%
TOTAL:	804	100%	804	100%

* Breakdown by questionnaire was not computed.
** Includes both phone and mail declines.

For the purposes of assessing the validity and reliability of the instruments, the total number of responses for each questionnaire (109 for Questionnaire A and 115 for Questionnaire B) was used. However, only the 94 matched responses were used for the testing of the research model and for presenting the characteristics of the participating MNCs.

4.2.2   Characteristics of Participating MNCs

The characteristics of the participating firms are based on the background

information collected in the questionnaires and on the data available for each

organization in the Hoovers directory. These include primary industry, the annual sales

revenue, the number of employees, and the number of years maintaining international

operations.

4.2.2.1 Industry Representation

Table 4.3 shows the breakdown of the sample according to the primary industry in which the participating MNC operates. Although there is a slightly higher concentration of participating firms in the Electronic & Other Electronic Equipment industry, the sample incorporates a wide range of industries and appropriately reflects the distribution of MNCs across industries.

Table 4.3 – Sample Representation by Primary Industry

SIC Code	Primary Industry	Count	%
36	Electronic & Other Electric Equipment	21	22
35	Industrial Machinery and Equipment	14	15
37	Transportation Equipment	12	13
28	Chemicals and Allied Products	12	13
38	Instruments and Related Products	8	9
29	Petroleum and Coal Products	6	6
20	Food and Kindred Products	5	5
27	Printing and Publishing	4	4
39	Miscellaneous Manufacturing Industries	3	3
30	Rubber and Misc. Plastics Products	3	3
26	Paper and Allied Products	3	3
25	Furniture and Fixtures	2	2
34	Fabricated Metal Products	1	1
	TOTAL:	94	100

4.2.2.2 Annual Sales Revenue

Table 4.4 illustrates the distribution of firms in the final sample based on their

annual sales revenue. About 42% of the sample has revenues below 1 billion dollars, 27%

between 1 and 5 billions dollars, and 31% above 5 billions dollars, indicating a slightly

higher representation in the sample of smaller multinational firms.

Table 4.4 – Sample Representation by Annual Sales Revenue

Sales ($ Millions)	Count	%
< 300	19	20
300 to 600	11	12
600 to 1000	9	10
1000 to 2000	15	16
2000 to 3000	5	5
3000 to 5000	6	6
> 5000	29	31
TOTAL:	94	100

4.2.2.3 Number of Employees

Table 4.5 describes the sample in terms of the worldwide number of employees.

75% of the firms in the sample have more than 2,000 employees worldwide, indicating

the presence of relatively large corporations in the sample. This was expected given the

nature of these firms, multinational organizations with operations in multiple countries.

Table 4.5 – Sample Representation by Number of Employees

Employees	Count	%
300 to 1000	11	12
1000 to 2000	12	13
2000 to 5000	17	18
5000 to 10000	17	18
10000 to 20000	11	12
> 20000	26	27
TOTAL:	94	100

4.2.2.4 Internationalization

The level of internationalization of the multinational organizations that comprise the sample was characterized in three ways:

a) The number of national units (including the corporate headquarters) of each participating MNC, which is depicted in Table 4.6;

b) The non-US sales of each participating MNC as a percentage of the firm's total sales (Table 4.7);

c) The numbers of years that the participating MNC has maintained foreign operations, which is shown on Table 4.8.

These tables show that over 50% the multinational corporations in the sample have at least 10 national units, have at least 25% of their revenues coming from abroad, and have been maintaining foreign operations for at least 15 years. This indicates to us that the sample is comprised by MNCs with well-established foreign operations.

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Table 4.6 – Sample Representation by Number of National Units

National Units	Count	%
3 to 5	15	16
6 to 10	21	22
11 to 20	23	24
21 to 40	19	20
Over 40	16	18
TOTAL:	94	100

Table 4.7 – Sample Representation by Percent of Non-US Sales

Non-US Sales (%)	Count	%
< 10%	1	1
10 to 25%	17	18
25 to 50%	27	29
50 to 75%	13	14
> 75%	1	1
Missing Data	35	37
TOTAL:	94	100

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Table 4.8 – Representation in Final Sample by Years of Foreign Operations

Years of Int'l Operations	Count	%
5 or Less	16	17
6 to 10	18	19
11 to 15	7	7
16 to 25	11	12
25 or More	40	43
Missing Data	2	2
TOTAL:	94	100

4.2.3   Characteristics of Individual Respondents

The characteristics of individual respondents will be summarized by job titles.

Since this study was designed to assess the organizational and IT aspects of interests from

top executives within the multinational corporation, we would expect our respondents to

be at least at the Director level. The breakdown presented in Table 4.9 and Table 4.10

lends support to the validity of the sample in terms of the respondents' position within the

firm. Table 4.10 also shows that at least 70% of the respondents to the Questionnaire B

were IT specific professionals.

Table 4.9 – Respondents to Questionnaire A by Job Title

Job Title	Count	%
CEO/PRESIDENT	17	18
COO/CIO/CFO	12	13
EVP/SVP	13	14
VP	17	18
Director	21	22
Manager	6	6
Other	5	5
Missing Data	3	3
TOTAL:	94	100

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Table 4.10 – Respondents to Questionnaire B by Job Title

Job Title		Count	%
	CIO	22	23
	SVP IT	1	1
IT Titles	VP IT	18	19
	DIR IT	25	27
	Manager IT	5	5
	CEO/PRESIDENT	1	1
	COO/CFO	2	2
	SVP	2	2
Non-IT Titles	VP	7	7
	DIR	2	2
	Manager	5	5
	Other	2	2
Missing Data		2	2
	TOTAL:	94	100

4.2.4 Non-Response Bias Analysis

The respondents and non-respondents were compared in terms of the annual sales

revenues and the number of employees. Data for this analysis was obtained from the

company profile available at the *Hoover's Online* database for the 804 companies in the

sample. One-way ANOVA was used to test for differences between the two groups. No

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significant differences were found for both annual sales and number of employee measures, indicating that our data collection process did not lead to non-response bias.

4.3 Content Validity

Content validity is the first step in assessing the construct validation as discussed by Cook (1979). Content validity aims at obtaining the theoretical and observational meaningfulness of concepts, which are among the several criteria that must be met in order to claim construct validity (Bagozzi 1980). Theoretical meaningfulness is achieved by clearly defining theoretical constructs while observational meaningfulness concerns the correspondence between unobserved variables and the observable variables to be measured. Observationally meaningful constructs have clear and unambiguous observable phenomena.

Content validity can be satisfied through a process that includes the specification of the domain of the construct, the generation of a sample of items, and the refinement of the items (Nunnally 1978, Churchill 1979, Kerlinger, 1988). However, there are no quantitative tests associated with either of these two criteria. Satisfying them lies in the researcher's ability to effectively communicate the nature of theoretical constructs and their relationships with observable phenomena.

Several steps were taken to guarantee the content validity of this study. These included:

- Clearly defining the domain of the constructs;

- Generating a sample of items using previous literature and field interviews;

- Refining the sample of items by pre-testing the instrument with practitioners and other researchers;

- Conducting a pilot study and revising the several items for their consistency, clarity, and understandability.

These several steps were described in detail in previous chapters of this dissertation. Content validity was achieved through the development, refinement, and testing procedures presented in those chapters.

4.4 Construct Validity

The goal of the construct validity assessment is to verify the extent to which a measurement instrument actually assesses the respective underlying theoretical constructs (Carmines and Zeller 1979). Convergent and discriminant validity are two related concepts used to assess the validity of a construct.

Convergent validity refers to the extent to which multiple scales measuring the same construct are in agreement (Nunnally 1978). Determining the level of correlation among measures of a construct can be used to assess convergent validity. Measures that correlate highly with other measures of the same construct provide evidence of convergent validity.

Discriminant validity refers to the extent to which a measure a construct does not correlate with measures of other constructs. Assessment of discriminant validity is especially important for independent variables, where multicollinearity can affect the results of a path analysis. Determining the level of correlation between measures of different constructs can be used to assess discriminant validity. Measures a construct that

correlate highly with measures of other constructs provide evidence of poor discriminant validity.

Various techniques may be used to test convergent and discriminant validity. In this study, factor analysis and corrected-item total correlation were used to initially assess the construct validity of the measures. Through an iterative process, the several items of each instrument were analyzed and the overall measures refined so as to achieve a measurement model with acceptable properties of convergent and discriminant validity. Whenever necessary, items that did not contribute to the achievement of convergent and discriminant validity were dropped from the analysis.

Convergent validity for a construct is established when all items measuring the construct are clearly clustered into the same factor. In addition, one should expect the item score to correlate highly with total score of the other measures of the same construct. This correlation is referred to as corrected-item total correlation.

Discriminant validity for a construct is established when an item demonstrates loads with a factor more significantly than with other factors. Items that exhibit high loading with two or more factors indicate a more complex structure, a structure that maps the item to multiple constructs. This characteristic is particularly undesirable for independent variables, where multicollinearity of constructs can become an issue.

In order to confirm the validity of our constructs, we took an extra step and submitted the model resulting from the factor analysis procedures used to establish construct validity to a Confirmatory Factor Analysis (CFA) using Structural Equation Modeling (SEM) techniques. Several fit indexes were used to assess the "goodness-of-

fit" of the measurement model for each of our constructs. These indexes are presented in a later section, when the step-by-step procedures for instrument validation are presented.

4.5 Reliability

An instrument's reliability refers to how consistently the instrument measures whatever it was designed to measure. In highly reliable instruments, the values are influenced to a much greater extent by the underlying construct than by random error.

Reliability can be assessed through the instrument's internal consistency. An indicator of internal consistency is the Cronbach alpha coefficient. It provides a means of determining the reliability of a measure from a single administration of an instrument. It can be interpreted as the total variance of the item scores due to variability in the underlying factor (Crocker and Algina 1986). A low alpha value indicates that the sample of items is highly influenced by random error whereas a high value (close to 1) is an indication that the items are internally related in the expected manner.

An alpha coefficient of 0.7 or higher is considered acceptable for widely used instruments (Nunnally 1978). Alphas around or greater than 0.6 are considered acceptable for exploratory construct measurement (Nunnally 1978). The choice of the cut-off score depends on the type of research and the kinds of decisions being made on the basis of the research results (Pedhazur and Schmelkin 1991).

Within a CFA framework using structural equation modeling (SEM), reliability can be assessed by computing the proportion of variance, R^2, in an observed variable that is accounted for by all latent constructs that are hypothesized to affect it (Bollen 1989).

This coefficient of determination is readily available from SEM programs such as AMOS and will be used to assess the reliability of the items measuring a particular construct.

4.6 Instrument Validation Procedures

Based on the above discussion, a set of criteria and rules were established to guide our efforts to ensure the validity and reliability of the instruments. The step-by-step procedures described below follow recommendations suggested in the literature (Sethi and King 1991, Sethi and King 1994, Nunnally 1978, Kline 1998, Mueller 1996). These include:

1. All items measuring the several constructs were subject to an initial factor analysis. Items measuring different dimensions of a same construct were factor-analyzed together for discriminant validity assessment. Principal component analysis with oblique rotation was used to facilitate the interpretation of the factor solution.

2. After performing the computations, only factors with eigenvalues greater than 1 were retained.

3. To guarantee the significance of item loadings, only those items with loadings of at least 0.4 on any factor were retained.

4. To assure discriminant validity and a simple structure for the resulting factors, items with loadings greater than 0.4 on two or more factors were dropped.

5. This process was repeated until a stable measurement model was achieved.

6. Whenever necessary, our judgement was exercised to guarantee appropriate interpretation of the resulting models. Decisions concerning the measurement model for specific constructs will be discussed when the resulting models are presented.

7. Once the final measurement model for each construct was achieved, the corrected item-total correlation was computed for each item. This correlation was computed using only the items that clustered together (i.e., items belonging to the same factor).

8. Cronbach's Alphas were used as an indicator of reliability for each construct. Cronbach's Alphas were computed for each factor resulting from the factor analysis procedure. An item was dropped from the measurement model if deleting the item significantly increased the reliability of the scale.

9. The final measurement model was then submitted to a confirmatory factor analysis (CFA) using structural equation modeling (SEM). AMOS was used for this analysis. Several goodness-of-fit indexes were used to assess the validity properties of the overall measurement model. These indexes and acceptable ranges of values are presented on Table 4.11. It should be noticed, however, that these acceptable ranges assume a relatively large sample size (Kline 1998). We will therefore use them as suggestions rather than clear-cut guidelines.

Table 4.11 – Goodness-of-Fit Indexes for Structural Equation Modeling

Index	Acceptable Range
Chi-Square/Degrees of Freedom Ratio	< 3
Bentler Comparative Fit Index (CFI)	> 0.90
Bentler-Bonett Non-Normed Fit Index (NNFI)	> 0.90
Standardized Root Mean Squared Residual (SRMR)	< 0.10

The results of the construct validity and reliability analyses for the various constructs are discussed in the following sections. Summary tables present the item

wording, all factor loadings above 0.4, corrected item-total correlations for each factor

(only items belonging to the factor were included), eigenvalues, percentage of variance

explained by the overall measurement model, and the Cronbach's Alpha coefficient for

each factor. Measurement models, their properties, and goodness-of-fit indexes are

presented in a separate figure for each of the constructs of this study.

4.7 Industry Globalization Potential Measures

Table 4.12 presents the data validation results for Industry Globalization

Potential. Twelve items were used to measure the dimensions of Industry Globalization

Potential. After submitting these items to the validation procedure described in Section

4.6, the 3 items intended to measure the technological intensity dimension, clustered in

one factor, were dropped from subsequent analyses due to the low reliability of the scale.

The remaining items clustered as expected: 3 items for economies of scale, 3 items for

market homogenization, and 3 items for comparative advantages.

The overall measurement model for Industry Globalization Potential explains

61.9% of the data variance. All corrected item-total correlations are greater than .35.

Cronbach's Alpha for the Market Homogenization factor is 0.71 and both the

Comparative Advantage and Economies of Scale factors demonstrate Alpha coefficients

above the 0.6 level.

The results of the confirmatory factor analysis (CFA) using structural equation

modeling (SEM) for Industry Globalization Potential are displayed in Figure 4.1. The

goodness-of-fit indexes can be considered satisfactory, although the CFI and NNFI

coefficients are slightly below the 0.90 suggested by Kline (1998). The proportion of

variance, R^2, indicates low reliability properties for items ADVANT3 (.18) and SCALE3 (.29). However, a review of the reliability analysis showed us that dropping any of these items would substantially reduce the reliability of the scales. We therefore decided to maintain these items in the measurement model. The standardized loadings for all items (except ADVANT3) are above the 0.5 level, indicating a reasonably large factor loading for all items.

Table 4.12 – Factor Analysis – Industry Globalization Potential

Items	Item Code	Factor 1 Loadings	Factor 2 Loadings	Factor 3 Loadings	Corrected Item-Total Correlations
1. Selling products globally reduces unit production cost	SCALE1	.800			.43
2. Operating at an efficient scale requires foreign expansion	SCALE2	.744			.48
3. International operations are economically attractive	SCALE3	.684			.39
4. Customers have common purchasing habits worldwide	HOMOGE1		.652		.51
5. Needs for products and services are similar worldwide	HOMOGE2		.677		.55
6. Similar expectations about products exist worlwide	HOMOGE3		.903		.52
7. Wages vary significantly across countries	ADVANT1			.799	.53
8. The availability of relevant skills varies across countries	ADVANT2			.829	.48
9. Interest rates differ substantially across countries	ADVANT3			.632	.36
Eigenvalue		2.803	1.680	1.088	
Cronbach's Alpha		.62	.71	.64	
Total Variance Explained		61.9 %			

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Factor Analysis - Industry Globalization Potential
Standardized estimates

Chi square = 43.92 (df = 24, p = .01)
Chi square/df = 1.83
CFI = .89
NNFI = .84
SRMR = .09 (PCLOSE = .07)
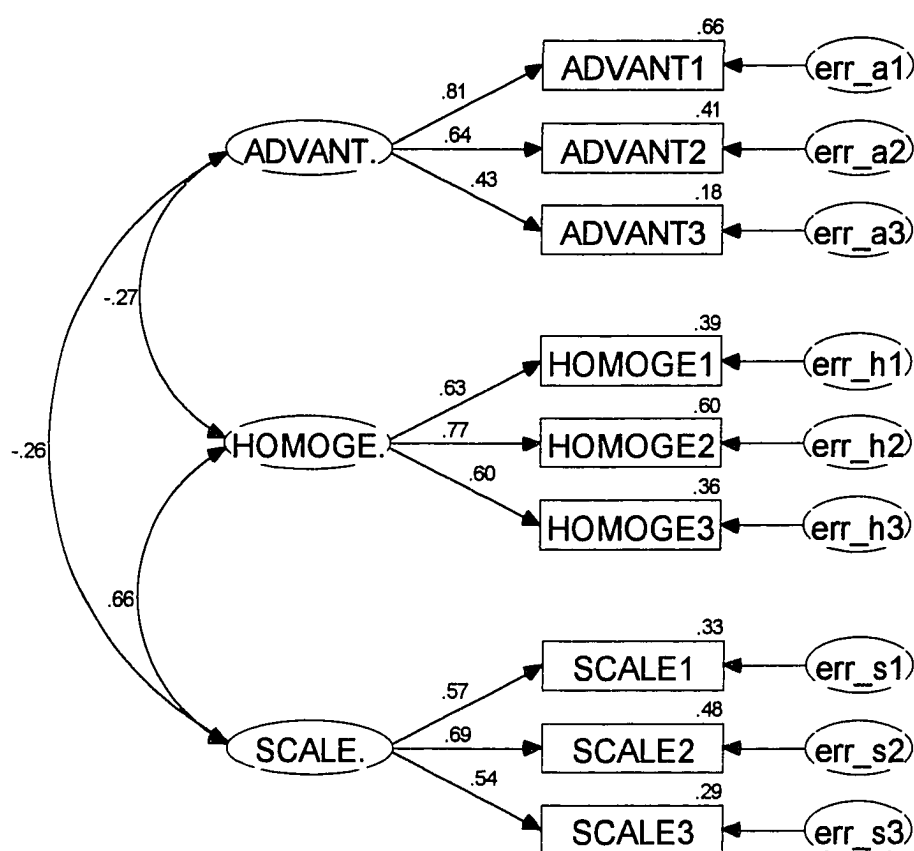
Figure 4.1 – CFA Model – Industry Globalization Potential

4.8 Global Strategic Orientation Measures

Table 4.13 presents the data validation results for the Global Strategic Orientation construct. The 15 items used to measure the dimensions of Global Strategic Orientation were submitted to the validation procedure described in Section 4.6. Although the factor analysis resulted in 4 factors, two factors were dropped from subsequent analysis due to their low reliability coefficients. Factor 1 comprises of 2 items intended to measure the market participation and 2 items intended to measure the national unit's role. Factor 2 encompasses 2 items intended to measure the operational flexibility of the MNC and 1 item intended to measure the firm's competitive moves. Factor 2 originally contained a fourth item but this item was dropped to improve the reliability of the scale. Reviewing the items' wording indicated to us the appropriateness of the clustering pattern.

The final measurement model for Global Strategic Orientation explains 63.4% of the data variance. All corrected item-total correlations are greater than .50 and the Cronbach's Alpha reliability coefficient for both factors is above the 0.7 level.

The results of the CFA using SEM for Global Strategic Orientation are displayed in Figure 4.2. None of the goodness-of-fit indexes achieved the minimum values suggested by Kline (1998), raising some concerns about the validity of the measurement model. The proportion of variance, R^2, indicates low reliability properties for MKTPART1 (.21). A review of the reliability analysis showed us that dropping this item would substantially reduce the reliability of the scale. The standardized loadings for all items (except MKTPART1) are above the 0.5 level, indicating a reasonably large factor loading for all items.

Table 4.13 – Factor Analysis – Global Strategic Orientation

Items	Item Code	Factor 1 Loadings	Factor 2 Loadings	Corrected Item-Total Correlations
1. Investments in national markets are primarily based on their contribution to the organization's global positioning	MKTPART1	.643		.53
2. National markets are chosen based on their potential to enhance the global competitiveness of your organization	MKTPART2	.665		.56
3. National units are assigned different strategic roles based on their unique strengths and competencies	UNIROLE1	.873		.60
4. National units operating in markets offering unique advantages are assigned distinctive strategic roles	UNIROLE3	.916		.71
5. Response to changes in government policies usually involves actions in multiple national units	OPEFLEX2		.824	.51
6. Operational flexibility is achieved by the concurrent adaptation of multiple national units to uncertain events	OPEFLEX3		.851	.64
7. The response to a competitive attack in one national market involves the concerted action of multiple units	MOVES2		.715	.51
Eigenvalue		3.294	1.144	
Cronbach's Alpha		.79	.73	
Total Variance Explained		63.4 %		

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Factor Analysis - Global Strategic Orientation
Standardized estimates

Chi square = 43.66 (df = 13, p = .00)
Chi square/df = 3.36
CFI = .89
NNFI = .81
SRMR = .15 (PCLOSE = .00)
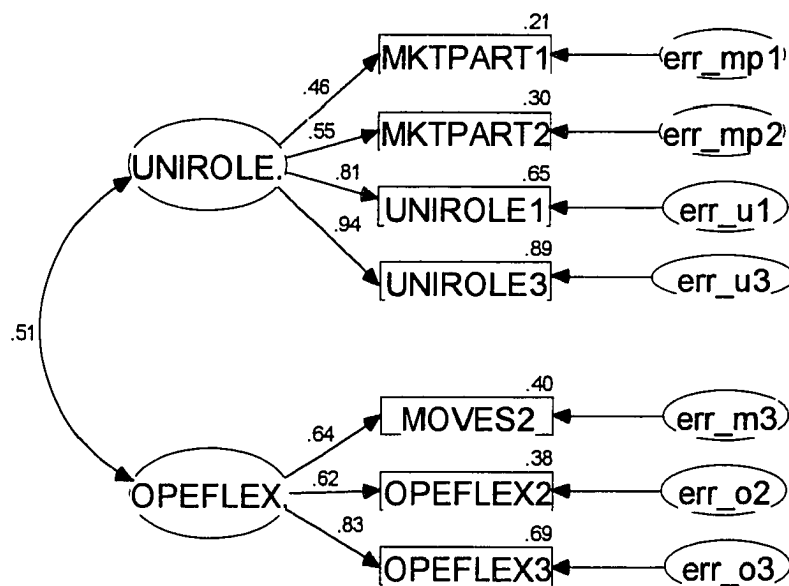
Figure 4.2 – CFA Model – Global Strategic Orientation

4.9 Global Interdependence Measures

Table 4.14 presents the data validation results for the construct of Global Interdependence. For the validation procedure we only included the items in Questions 1 through 6. Each question requests the assessment of the underlying dimension of global interdependence across 4 distinct type of resources: physical, information, human, and financial. We therefore expected the structure of the global interdependence construct to be same across these types of resources. After our initial factor analysis, six factors emerged. Two factors contained only two items and these items loaded more significantly in the remaining four factors. In addition, their eigenvalues were significantly lower than those of the 4 remaining factors. We therefore decided to rerun the factor analysis program, this time forcing the extraction of 4 factors only. The resulting model was stable and exhibited the same structure for each type of resource: all items related to a particular resource type clustered as one single factor. To confirm and reassure our results, we ran separate factor analyses including only the items related to a particular resource type. In all cases, the items clustered along a single factor, confirming our previous findings.

The overall measurement model for Global Interdependence explains 64.5% of the data variance. The majority (19) of the corrected item-total correlations are greater than .60. Cronbach's Alphas for all four factors are above the 0.8 level.

We were not able to run a confirmatory factor analysis using SEM for the construct of Global Interdependence due to the large number of items and our relatively small sample size. We, however, believe that satisfactory validity and reliability results were achieved through the conventional procedures.

Table 4.14 – Factor Analysis – Global Interdependence

Items	Item Code	Factor 1 Loadings	Factor 2 Loadings	Factor 3 Loadings	Factor 4 Loadings	Corrected Item-Total Correlations
1. To what extent are Physical Resources exchanged among national units?	EXCPHYS	.790				.70
2. How important is the exchange of Physical Resources among national units?	IMPPHYS	.894				.79
3. How dependent are national units on one another for Physical Resources?	DEPPHYS	.851				.80
4. How difficult would it be for national units to expand operations without significant transfer of Physical Resources from other national units?	DIFFPHYS	.615				.58
5. How frequently do the national units exchange Physical Resources?	FREQPHYS	.851				.83
6. How delayed can the exchange of Physical Resources among the national units be before the operations of your organization are negatively affected?	DELPHYS	.869				.84
Eigenvalue		5.978	4.577	2.811	2.119	
Cronbach's Alpha		.89	.81	.83	.87	
Total Variance Explained		64.5 %				

Table 4.14 (cont'd)

Items	Item Code	Factor 1 Loadings	Factor 2 Loadings	Factor 3 Loadings	Factor 4 Loadings	Corrected Item-Total Correlations
7. To what extent are Human Resources exchanged among national units?	EXCHR		.848			.71
8. How important is the exchange of Human Resources among national units?	IMPHR		.792			.62
9. How dependent are national units on one another for Human Resources?	DEPHR		.730			.60
10. How difficult would it be for national units to expand operations without significant transfer of Human Resources from other national units?	DIFFHR		.598			.53
11. How frequently do the national units exchange Human Resources?	FREQHR		.759			.66
12. How delayed can the exchange of Human Resources among the national units be before the operations of your organization are negatively affected?	DELHR		.727			.66
	Eigenvalue	5.978	4.577	2.811	2.119	
	Cronbach's Alpha	.89	.81	.83	.87	
	Total Variance Explained		64.5 %			

Table 4.14 (cont'd)

Items	Item Code	Factor 1 Loadings	Factor 2 Loadings	Factor 3 Loadings	Factor 4 Loadings	Corrected Item-Total Correlations
13. To what extent are Financial Resources exchanged among national units?	EXCFIN			-.823		.75
14. How important is the exchange of Financial Resources among national units?	IMPFIN			-.774		.70
15. How dependent are national units on one another for Financial Resources?	DEPFIN			-.830		.76
16. How difficult would it be for national units to expand operations without significant transfer of Financial Resources from other national units?	DIFFFIN			-.693		.56
17. How frequently do the national units exchange Financial Resources?	FREQFIN			-.768		.67
18. How delayed can the exchange of Financial Resources among the national units be before the operations of your organization are negatively affected?	DELFIN			-.794		.70
Eigenvalue		5.978	4.577	2.811	2.119	
Cronbach's Alpha		.89	.81	.83	.87	
Total Variance Explained				64.5 %		

Table 4.14 (cont'd)

Items	Item Code	Factor 1 Loadings	Factor 2 Loadings	Factor 3 Loadings	Factor 4 Loadings	Corrected Item-Total Correlations
19. To what extent is Information exchanged among national units?	EXCINFO				-.807	.60
20. How important is the exchange of Information among national units?	IMPINFO				-.747	.55
21. How dependent are national units on one another for Information?	DEPINFO				-.822	.63
22. How difficult would it be for national units to expand operations without significant transfer of Information from other national units?	DIFFINFO				-.668	.50
23. How frequently do the national units exchange Information?	FREQINFO				-.592	.70
24. How delayed can the exchange of Information among the national units be before the operations of your organization are negatively affected?	DELINFO				-.555	.65
Eigenvalue		5.978	4.577	2.811	2.119	
Cronbach's Alpha		.89	.81	.83	.87	
Total Variance Explained			64.5 %			

4.10 Global Correspondence Measures

Table 4.15 presents the data validation results for the Global Correspondence construct. The 12 items used to measure the dimensions of Global Correspondence were submitted to the validation procedure described in Section 4.6. The factor analysis resulted in 2 factors. During the process 3 items were dropped from further analysis due to their complex structure (significant loadings in more than one factor). Factor 1 comprises of 3 items intended to measure the level of agreement among units and 2 items intended to measure the conflict of objectives among national units. Factor 2 encompasses 3 items intended to measure the national's unit compliance to the MNC's global strategy and 1 item intended to measure the conflict of objectives among national units. Reviewing the items' wording indicated to us the appropriateness of the clustering pattern even though the items intended to measure conflict of objectives did not get clustered in a separate factor.

The final measurement model for Global Correspondence explains 57.7% of the data variance. All corrected item-total correlations are greater than .40 and the Cronbach's Alpha reliability coefficient for both factors is above the 0.7 level.

The results of the CFA using SEM for Global Correspondence are displayed in Figure 4.3. All goodness-of-fit indexes are satisfactory and within the ranges suggested by Kline (1998). The proportion of variance, R^2, indicates low reliability properties for the items AGREE3 (.26), OBJCFT3 (.26) and COMPLY3 (.21). However, a review of the reliability analysis showed us that dropping any of these items would substantially reduce the reliability of the scales. The standardized loadings for all items (except COMPLY3) are above the 0.5 level, indicating satisfactory factor loadings.

Table 4.15 – Factor Analysis – Global Correspondence

Items	Item Code	Factor 1 Loadings	Factor 2 Loadings	Corrected Item-Total Correlations
1. National units disagree over the ways operations are managed by the multinational organization (reverse)	AGREE1	.878		.76
2. National units agree over the scheduling of activities across the multinational organization	AGREE3	.465		.44
3. National units disagree over the allocation of resources across the multinational organization (reverse)	AGREE5	.892		.59
4. Conflict of interests exist among national units (reverse)	OBJCFT1	.753		.68
5. Goals of the national units for local markets are in conflict with those of the multinational organization (reverse)	OBJCFT3	.582		.48
6. National units' actions are consonant with executing the global strategy set forth by the multinational organization	COMPLY2		.681	.61
7. National units follow global marketing recommendations made by the multinational organization	COMPLY3		.875	.43
8. National units accept and implement the operational resolutions made by the multinational organization	COMPLY4		.526	.53
9. Priorities set by the national units are congruent with the goals of the multinational organization	OBJCFT2		.506	.56
Eigenvalue		4.071	1.119	
Cronbach's Alpha		.80	.74	
Total Variance Explained		57.7 %		

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Factor Analysis - Correspondence
Standardized estimates

Chi square = 39.53 (df = 26, p = .04)
Chi square/df = 1.52
CFI = .96
NNFI = .94
SRMR = .07 (PCLOSE = .22)
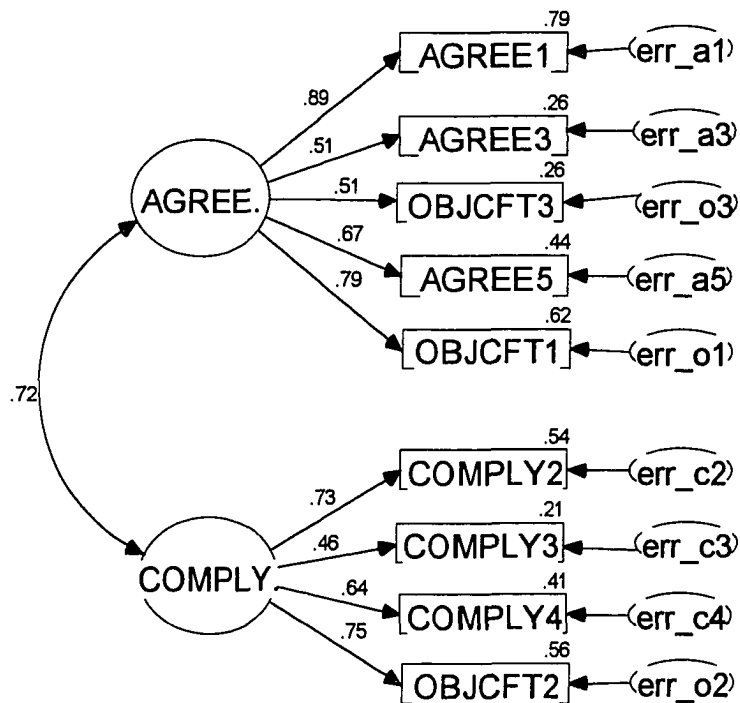
Figure 4.3 – CFA Model – Global Correspondence

4.11 Global Org. Infrastructure – Vertical Coordination Mechanisms

Table 4.16 presents the data validation results for the Vertical Coordination

Mechanisms of the Global Organizational Infrastructure. Twelve items were used to

measure the four dimensions of the construct. After submitting these items to the

validation procedure described in Section 4.6, all items, except for one, clustered as

expected, leading to a total of 4 factors. One item intended to measure formalization in

the relationship among national units clustered with the items intended to measure the

extent of use of behavioral control mechanisms. A review of the wording of this item

indicated an acceptable clustering pattern.

The overall measurement model for the Vertical Coordination Mechanisms of the

Global Organizational Infrastructure explains 70.8% of the data variance. Most corrected

item-total correlations are above the 0.5 level. Cronbach's Alphas for the Behavioral and

Output Control factors are above the 0.8 level while the Centralization and Formalization

factors demonstrate Alpha coefficients above the 0.6 level.

The results of the CFA model for the Vertical Coordination Mechanisms of the

Global Organizational Infrastructure are displayed in Figure 4.4. The goodness-of-fit

indexes can all be considered satisfactory, even though the NNFI coefficient (0.87) is

slightly below the 0.90 level. The proportion of variance, R^2, is satisfactory for all items.

The standardized loadings for all items are above the 0.5 level, indicating reasonably

large factor loadings.

Table 4.16 – Factor Analysis – Global Org. Infrastructure – Vertical Coordination Mechanisms

Items	Item Code	Factor 1 Loadings	Factor 2 Loadings	Factor 3 Loadings	Factor 4 Loadings	Corrected Item-Total Correlations
1. The corporate headquarters evaluates the procedures used by the national units to accomplish a given task	BEHCTRL1	.859				.63
2. The corporate headquarters monitors the extent to which the national units follow established procedures	BEHCTRL2	.557				.63
3. The corporate headquarters modifies the national units' procedures when desired results are not obtained	BEHCTRL3	.758				.55
4. National units are provided with procedures that define the course of action to be taken under different situations	FORMAL2	.686				.65
5. If the national units' performance goals are not met, they are required to explain why	OUTCTRL1		.824			.63
6. Specific performance goals are established for the activities of the national units	OUTCTRL2		.774			.65
7. The corporate headquarters monitors the extent to which the national units' attain their performance goals	OUTCTRL3		.931			.74
Eigenvalue		3.722	2.467	1.210	1.098	
Cronbach's Alpha		.80	.81	.68	.67	
Total Variance Explained		70.8 %				

Table 4.16 (cont'd)

Items	Item Code	Factor 1 Loadings	Factor 2 Loadings	Factor 3 Loadings	Factor 4 Loadings	Corrected Item-Total Correlations
8. Decisions regarding the strategies and operations of national units are made at the corporate headquarters	CENTRAL1			.682		.45
9. In general, national units enjoy autonomy for deciding their strategies and operating policies (reverse)	CENTRAL2			.889		.58
10. National units maintain discretion over their operations and the scheduling of their activities (reverse)	CENTRAL3			.666		.47
11. A fairly well defined set of rules and policies is available for the activities of the national units	FORMAL1				.732	.51
12. Policies and rules governing the activities of the national units are formalized through instruments such as manuals, standard operating procedures, etc.	FORMAL3				.836	.51
	Eigenvalue	3.722	2.467	1.210	1.098	
	Cronbach's Alpha	.80	.81	.68	.67	
Total Variance Explained			70.8 %			

Factor Analysis - Formal Org. Infrastructure
Standardized estimates

Chi square = 89.00 (df = 48, p = .00)
Chi square/df = 1.85
CFI = .90
NNFI = .87
SRMR = .09 (PCLOSE = .02)
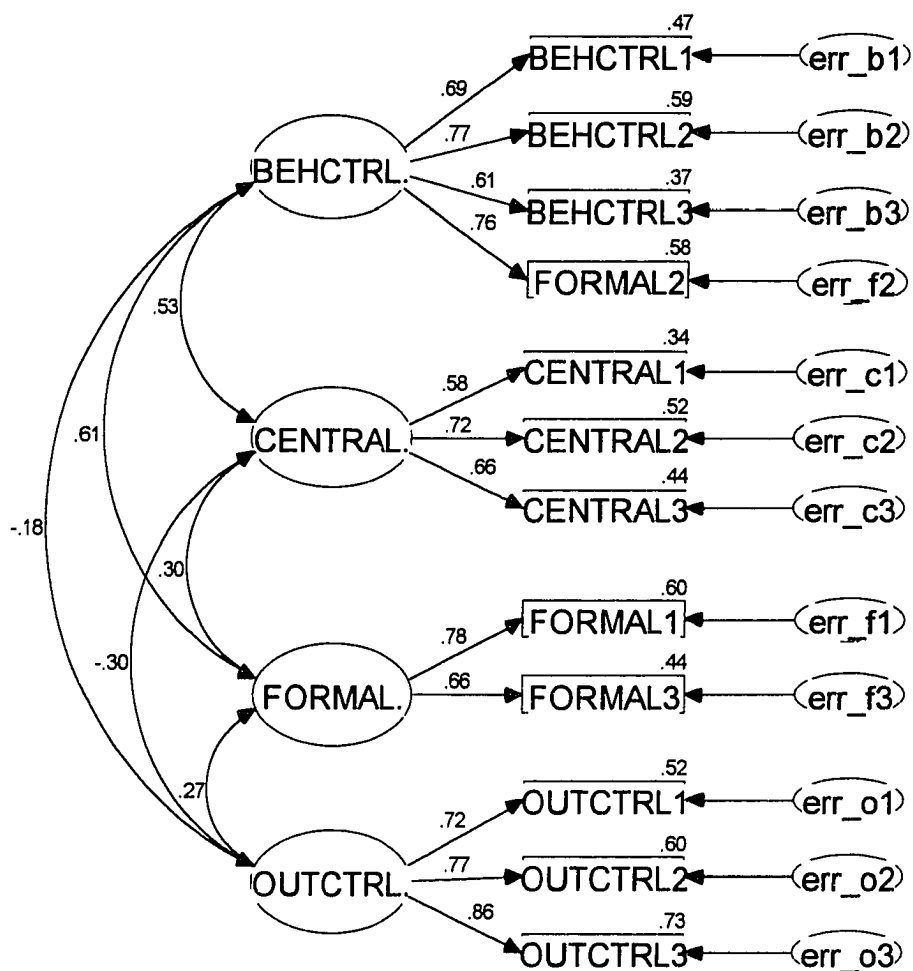
Figure 4.4 – CFA Model – Global Org. Infrastructure – Vertical Coordination

Mechanisms

4.12 Global Org. Infrastructure – Lateral Coordination Mechanisms

Table 4.17 presents the data validation results for the lateral coordination mechanisms of the Global Organizational Infrastructure. The 9 items used to measure the dimensions of the construct were submitted to the validation procedure described in Section 4.6. The factor analysis resulted in 2 factors. During the process 2 items were dropped from further analysis due to their complex structure (significant loadings in more than one factor). Factor 1 comprises of 2 items intended to measure the use of lateral relation mechanisms among units and 2 items intended to measure the use the socialization mechanisms among national units. Factor 2 encompasses 3 items intended to measure the level of informal communications among national units.

The final measurement model explains 65.5% of the data variance. Except for one item, all corrected item-total correlations are greater than .50 and the Cronbach's Alpha reliability coefficient for both factors is above the 0.7 level.

The results of the confirmatory factor analysis using SEM for the Lateral Coordination Mechanisms of the Global Organizational Infrastructure are displayed in Figure 4.5. With the exception of the CFI, the goodness-of-fit indexes failed to achieve the minimum values suggested by Kline (1998), raising some concerns about the validity of the measurement model. The proportion of variance, R^2, for all items can be considered satisfactory, reinforcing the reliability properties of the items. The standardized loadings for are all above the 0.5 level, indicating a reasonably large factor loading for all items.

Table 4.17 – Factor Analysis – Global Org. Infrastructure – Lateral Coordination Mechanisms

Items	Item Code	Factor 1 Loadings	Factor 2 Loadings	Corrected Item-Total Correlations
1. Inter-unit teams and committees coordinate activities common to multiple national units	LATREL2	.816		.55
2. Your multinational organization makes use of task forces to facilitate collaboration among the national units	LATREL3	.802		.58
3. Your multinational organization maintains worldwide training programs for managers of the national units	SOCIAL2	.556		.63
4. Managers across national units are provided with well-defined and common career paths	SOCIAL3	.808		.68
5. Corporate meetings and gatherings aimed at increasing contact among national units' managers are sponsored by your multinational organization	INFCOM1		.719	.47
6. In general, managers across national units maintain personal informal contacts with each other	INFCOM2		.786	.64
7. Informal meetings are held to facilitate the interaction among managers of the national units	INFCOM3		.910	.61
	Eigenvalue	3.504	1.084	
	Cronbach's Alpha	.80	.74	
	Total Variance Explained	65.5 %		

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Factor Analysis - Informal Org. Infrastructure
Standardized estimates

Chi square = 29.15 (df = 8, p = .00)
Chi square/df = 3.64
CFI = .91
NNFI = .84
SRMR = .16 (PCLOSE = .00)
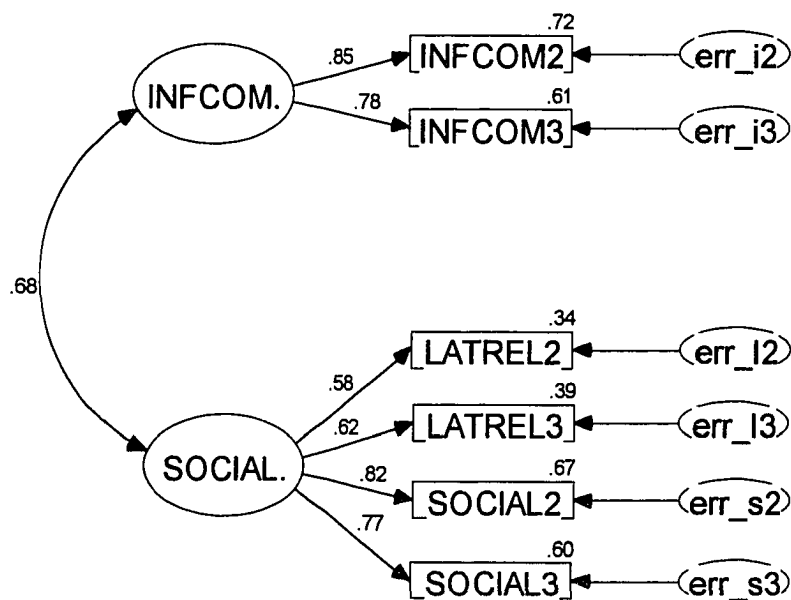
Figure 4.5 – CFA Model – Global Org. Infrastructure – Lateral Coordination

Mechanisms

4.13 Global IT Infrastructure – Range

Table 4.18 presents the data validation results for the Range of the Global IT Infrastructure. Fifteen items were used to measure the dimensions of platform compatibility, data transparency, and network connectivity. After submitting these items to the validation procedure described in Section 4.6, 6 items (2 for each dimension) were dropped from subsequent analyses to either significantly increase the reliability of the scale or to make simpler the structure of the factors. The remaining items clustered as expected: 3 items for measuring the range of platform compatibility, 3 items for measuring the range of data transparency, and 3 items for measuring the range of network connectivity.

The overall measurement model for the range of the Globalization IT Infrastructure explains 75.1% of the variance in the data. All corrected item-total correlations are at or above the 0.60 level. Cronbach's Alphas for all the 3 factors vary from 0.79 to 0.84.

The results of the CFA using SEM for the Range of the Global IT Infrastructure are displayed in Figure 4.6. All goodness-of-fit indexes achieved the minimum values suggested by Kline (1998). The proportion of variance, R^2, is relatively high for all items, demonstrating good reliability properties. All standardized loadings are above the 0.6 level, indicating a reasonably large factor loading for all items.

Table 4.18 – Factor Analysis – Global IT Infrastructure Range

Items	Item Code	Factor 1 Loadings	Factor 2 Loadings	Factor 3 Loadings	Corrected Item-Total Correlations
1. National units have similar hardware and operating systems configurations	RNGPLAT2	.888			.67
2. Applications developed at a national unit may be transferred to computer platforms of other units without major modifications	RNGPLAT3	.736			.60
3. Computer platforms used for critical shared tasks across national units are compatible	RNGPLAT4	.740			.64
4. National units maintain local databases with identical, replicated data elements and standard record structures	RNGDAT1		.734		.61
5. Databases maintained by the national units make use of standard record structures	RNGDAT4		.909		.74
6. Databases at national units make use of data definitions standardized across the multinational organization	RNGDAT5		.836		.79
7. The network/telecommunication infrastructure allows multiple national units to transmit various types of data (text, graphics and audio) electronically	RNGNET2			.603	.71
8. The network/telecommunication infrastructure is capable of carrying high bandwidth applications across units	RNGNET4			.895	.65
9. The network/telecommunication infrastructure allows multiple national units to hold electronic meetings	RNGNET5			.798	.67
Eigenvalue		4.830	1.164	1.081	
Cronbach's Alpha		.79	.84	.82	
Total Variance Explained		75.1 %			

Factor Analysis - Range of IT Infrastructure Standardized estimates

Chi square = 35.24 (df = 24, p = .06)
Chi square/df = 1.47
CFI = .98
NNFI = .97
SRMR = .06 (PCLOSE = .28)
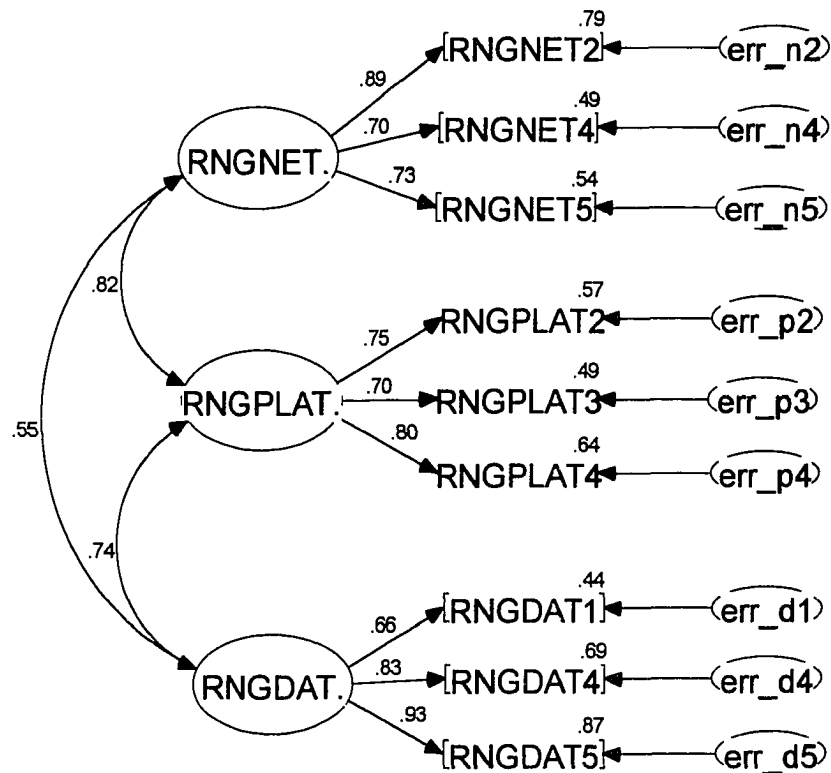
Figure 4.6 – CFA Model – Global IT Infrastructure Range

4.14 Global IT Infrastructure - Planning

Table 4.19 presents the data validation results for the Planning of the Global IT Infrastructure. Twelve items were analyzed for their validity and reliability properties. There were four items for each of the planning aspect: platform compatibility, data transparency, and network connectivity. Thus, we were expecting 3 distinct factors to emerge from the factor analysis. After running the procedure, only two factors emerged. One factor contained all items related to platform compatibility and network connectivity while the other contained all items related to data transparency. Based on these results, we decided to rerun the factor analysis program, this time forcing the extraction of 3 factors only. The resulting model was stable and clustered all the items for each dimension under a single factor. We therefore decided to keep this model and further explore its properties through confirmatory factor analysis using structural equation modeling. None of the factors were dropped in this process.

The overall measurement model for the Planning of the Global IT Infrastructure explains 79.3% of the data variance. All but one of the items demonstrated corrected item-total correlations above the 0.70 level. Since we forced the extraction of 3 factors, the eigenvalue for one of the factors was below 1 (0.902). Cronbach's Alphas for the three factors varied from 0.87 to 0.93.

The results of the CFA using SEM for the Planning dimension of the Global IT Infrastructure are displayed in Figure 4.7. All goodness-of-fit indexes are satisfactory and within the ranges suggested by Kline (1998). The proportion of variance, R^2, indicates satisfactory reliability properties for all items. The standardized loadings for all items are above the 0.7 level, indicating satisfactory factor loadings.

Table 4.19 – Factor Analysis - Global IT Infrastructure Planning

Items	Item Code	Factor 1 Loadings	Factor 2 Loadings	Factor 3 Loadings	Corrected Item-Total Correlations
1. Standardization of operating systems across units	PLNPLAT1	.854			.84
2. Compatibility of hardware across national units	PLNPLAT2	.850			.82
3. Standardization of hardware across national units	PLNPLAT3	.888			.84
4. Compatibility of operating systems across national units	PLNPLAT4	.780			.85
5. Standardization of record structures across units	PLNDAT1		.867		.83
6. The development of centralized databases for storage of data elements shared by multiple national units	PLNDAT2		.593		.72
7. The development of standard field definitions for data elements shared by multiple national units	PLNDAT3		.756		.78
8. The development of mechanisms to translate and/or map data elements across national units	PLNDAT4		.901		.77
9. The overall connectivity of mainframes/workstations/PCs across national units	PLNNET1			.627	.77
10. The development of networks for handling electronic transmission and distribution of data across units	PLNNET2			.710	.80
11. The development of networks for handling multimedia communication across national units	PLNNET3			.828	.66
12. The selection and use of network and/or telecommunication protocols by the national units	PLNNET4			.821	.72
	Eigenvalue	7.482	1.132	0.902	
	Cronbach's Alpha	.93	.90	.87	
	Total Variance Explained		79.3 %		

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Factor Analysis - Planning of IT Infrastructure
Standardized estimates

Chi square = 102.88 (df = 51, p = .00)
Chi square/df = 2.02
CFI = .95
NNFI = .94
SRMR = .09 (PCLOSE = .00)
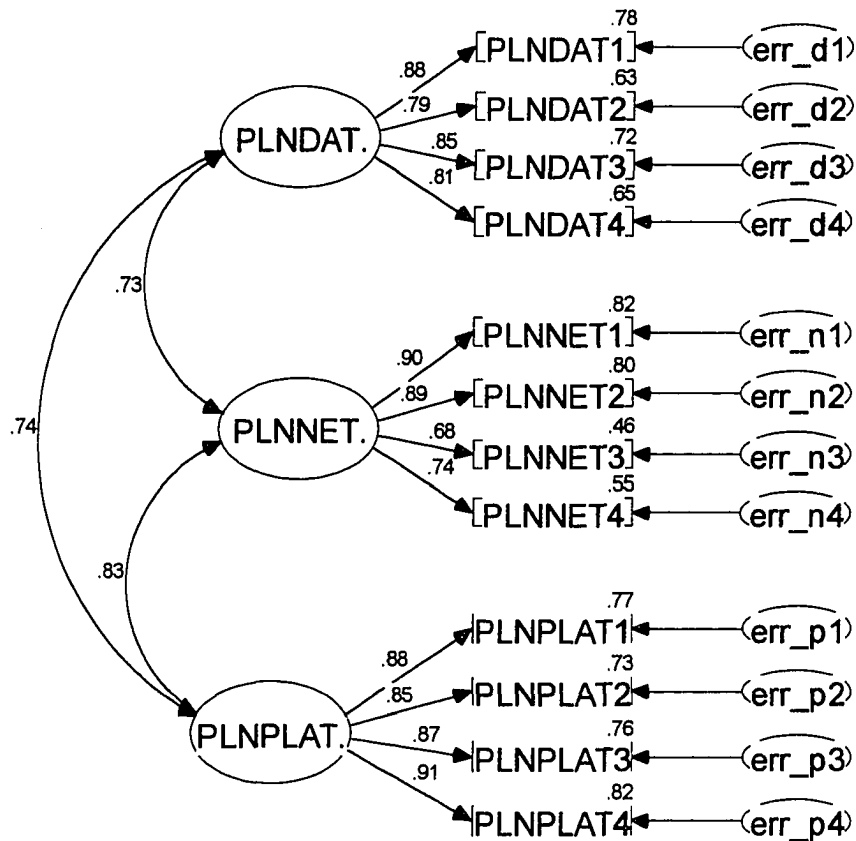
Figure 4.7 – CFA Model – Global IT Infrastructure Planning

4.15 Computation of the Final Scores

Once the solution becomes stable, the final factor scores may be computed. The literature provides four alternate techniques for computing factor scores. Scores may be obtained by using the score coefficients calculated by factor analysis of all items, or by using the factor analysis coefficients for only the factors forming a factor, or by simply summing the scores, raw or standardized, of variables which form a dimension (Kim 1978). Scores computed by the last three methods are called factor-based scores. Since there are no well-defined criteria for choosing one method over another, it was thus decided that our analysis would be performed using the scoring coefficients of only those variables that together form a dimension.

CHAPTER 5

Data Analysis Methods and Results

5.1 Data Analysis Methods

Tests of the research model and the various propositions and hypotheses were performed using path analysis techniques (Alwin and Hauser 1975, James, Mulaik and Brett 1983). In order to conduct the tests, we initially estimated the direct effects of the exogenous variables on the endogenous variables using hierarchical regression analyses. We then used these estimates of the direct effects to compute the indirect and total effects of an exogenous variable on an endogenous variable.

5.2 Predictors of Global Strategic Orientation

In the first level of data analysis, each dimension that resulted from our measurement analysis for Global Strategic Orientation was included in the regression equations as the dependent variable. These dimensions are National Unit Role (UNIROLE) and Operational Flexibility (OPEFLEX). The three dimensions identified for Industry Globalization Potential were included in the regression equation as independent variables. These dimensions are Comparative Advantages (ADVANT), Market Homogenization (HOMOGE) and Economies of Scale (SCALE). The resulting regression models are depicted in Table 5.1.

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The standardized coefficients β_1 through β_3 computed by the regression program were used as estimates of the direct effects or path coefficients of the dimensions of Industry Globalization Potential (ADVANT, HOMOGE and SCALE) on the dimensions of Global Strategic Orientation (UNIROLE and OPEFLEX). The significance levels of these β coefficients, computed using T-tests, were used to evaluate Proposition 1 and its related hypotheses. Finally, the adjusted R^2 for each equation was used as an indicator of the statistical power of the regression model.

Since no intervening variables exist on the path between the dimensions of Industry Globalization Potential and the dimensions of Global Strategic Orientation, no indirect effects exist between these sets of variables. Therefore, the total effect is simply the direct effect of the exogenous variables on the endogenous variables.

Table 5.1 – Regression Models – Global Strategic Orientation

Model	Regression Analysis Equation
1	UNIROLE = β_0 + β_1ADVANT + β_2HOMOGE + β_3SCALE
2	OPEFLEX = β_0 + β_1ADVANT + β_2HOMOGE + β_3SCALE

Table 5.2 – Predictors of Global Strategic Orientation

Predictor	UNIROLE Direct Effect	OPEFLEX Direct Effect
ADVANT	-.17	.18
HOMOGE	.01	.06
SCALE	-.03	-.14
Adjusted R^2	.030	.050

$* : p < 0.10 \quad ** : p < 0.05 \quad *** : p < 0.01$

Table 5.2 depicts the results for the regression models derived for the dimensions of Global Strategic Orientation. Proposition 1 and its derived hypotheses proposed that the MNC's global strategic orientation is positively associated to the globalization potential of the industry. Since none of the standardized coefficients (βs) in both regression equations reached significance, Proposition 1 and its related hypotheses are not supported by our sample data. None of the three dimensions of industry globalization potential (economies of scale, comparative advantages and market homogenization) are significant predictors of the MNC's global strategic orientation.

These results go against a central tenet in strategy theory where firms are believed to take actions towards the maximization of its 'fit' with the structural characteristics of the industry in which they operate. Our results also challenge previous international literature research that established a linkage between firms with a global strategic

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orientation and industries dominated by the drivers of globalization (Birkinshaw et al 1995, Yip 1992, Kobrin 1991).

While the possibility of empirical flaws are not discarded given our sample size and the measurement properties of these constructs, our results suggest that management does not necessarily act in response to stimuli from the external environment. The pursue (or non-pursue) of global strategic orientations in multinational organizations may occur independently of the industry pressures towards globalization. Management may be looking at a broader environment or perhaps using the internal environment of the firm when making decisions regarding the global strategic orientation of the firm. We will explore these possibilities in more detail when presenting an overall discussion of the results.

5.3 Predictors of Global Interdependence

For the next level of data analysis, the dimensions of Industry Globalization Potential and Global Strategic Orientation were included in the regression equations as independent variables and each of the dimensions for Global Interdependence became the dependent variable of interest. These dimensions are Global Interdependence on Physical Resources (ITDPPHYS), Information (ITDPINFO), Human Resources (ITDPHR) and Financial Resources (ITDPFIN). The resulting regression models are depicted in Table 5.3.

The standardized coefficients β_1 through β_5 computed by the regression program were used as estimates of the direct effects or path coefficients of the dimensions of Industry Globalization Potential (ADVANT, HOMOGE and SCALE) and Global

Strategic Orientation (UNIROLE and OPEFLEX) on the dimensions of Global

Interdependence. The significance levels of the coefficients β_4 and β_5 in each equation

were used to evaluate Proposition 2 and its related hypotheses while the adjusted R^2's

were used as indicators of the statistical power of the regression models.

The indirect effects of the dimensions of Industry Globalization Potential on the

dimensions of Global Interdependence represent those effects that are mediated by the

intervening variables (the dimensions of Global Strategic Orientation). The indirect

effects are computed by multiplying all path coefficients (β) along an indirect route from

the exogenous variable to the endogenous variable. When more than one indirect path

exists between the two variables of interest, the total indirect effect is reached by adding

the indirect effects along all possible routes. Finally, total effects are computed by adding

the direct effects and the indirect effects of the exogenous variable on the endogenous

variable.

Table 5.3 – Regression Models – Global Interdependence

Model	Regression Analysis Equation
3	$ITDPPHYS = \beta_0 + \beta_1 ADVANT + \beta_2 HOMOGE + \beta_3 SCALE + \beta_4 UNIROLE + \beta_5 OPEFLEX$
4	$ITDPINFO = \beta_0 + \beta_1 ADVANT + \beta_2 HOMOGE + \beta_3 SCALE + \beta_4 UNIROLE + \beta_5 OPEFLEX$
5	$ITDPHR = \beta_0 + \beta_1 ADVANT + \beta_2 HOMOGE + \beta_3 SCALE + \beta_4 UNIROLE + \beta_5 OPEFLEX$
6	$ITDPFIN = \beta_0 + \beta_1 ADVANT + \beta_2 HOMOGE + \beta_3 SCALE + \beta_4 UNIROLE + \beta_5 OPEFLEX$

Table 5.4 depicts the results for the regression models derived for the dimensions

of Global Interdependence. Proposition 2 and its derived hypotheses predicted a positive

association between the levels of global interdependence and the MNC's global strategic

orientation. Although not all standardized coefficients (βs) capturing the association were

significant, our data does lend some level of support to this proposition. Our study found

significant and positive relationships between the national units' role and the levels of

global interdependence on information, human and financial resources. Similarly, our

results also elucidated the positive relationship between the MNC's operational flexibility

and the interdependence among national units on information and physical resources.

These results indicate that the level of resource exchange increases as MNCs

adopt strategies that differentiate roles among national units. The specialization of units

inevitably creates entities that are no longer self-containing or self-sufficient–they must

transact with each other to obtain resources that exclusive to one or a small number of

national units. Similarly, as MNCs develop strategies to flexibly cope with and adapt to

the volatility and uncertainty of the national markets where they operate, they increase

the level and pattern of resource exchange among national units. This is particularly true

for physical resources and information.

In very few instances our study was able to establish a relationship between the

global potential of industry where the MNC operates and the levels of global

interdependence among national units. Similarly to the dimensions of global strategic

orientation, the levels of global interdependence are not related to the industry

globalization potential. This lends to support to the notion initially explored in the

previous section in which the process of global integration is conceptualized as occurring

more out managerial choice rather than stimuli from the external environment. Managers' strategic choices towards a multinational organization that more closely operates as a single unit seems to be more decisive than the structural characteristics of the external environment in which the MNC operates.

Table 5.4 – Predictors of Global Interdependence

Predictors	ITDPPHYS			ITDPINFO			ITDPHR			ITDPFIN		
	Direct Effect	Indirect Effect	Total Effect	Direct Effect	Indirect Effect	Total Effect	Direct Effect	Indirect Effect	Total Effect	Direct Effect	Indirect Effect	Total Effect
ADVANT	-.28***	.06	-.22**	-.06	.01	-.05	.39***	-.02	.37***	.13	-.06	.07
HOMOGE	-.04	.02	-.02	.00	.02	.02	.06	.01	.07	.13	.01	.14
SCALE	.12	-.05	.07	.15	-.04	.11	-.03	-.03	-.06	-.16	-.02	-.18*
UNIROLE	.02			.24**			.25**			.42***		
OPEFLEX	.35***			.27**			.15			.06		
Adjusted R^2	.24			.22			.17			.18		

* : $p < 0.10$ ** : $p < 0.05$ *** : $p < 0.01$

5.4 Predictors of Global Organizational Infrastructure

For analyzing the effects on the mechanisms of the Global Organizational

Infrastructure, the dimensions of Global Interdependence, Global Correspondence,

Global Strategic Orientation and Industry Globalization Potential were included in the

regression equations as independent variables. Each of the mechanisms that comprise the

Global Organizational Infrastructure became the dependent variable of interest. The

mechanisms comprising the Global Organizational Infrastructure were previously

categorized as vertical and lateral. Vertical mechanisms (also referred as formal

mechanisms) include the levels of centralization (CENTRAL), formalization

(FORMAL), behavioral control (BEHCTRL) and outcome control (OUTCTRL). Lateral

mechanisms include informal communications (INFCOM) and socialization (SOCIAL).

The resulting regression models are depicted on Table 5.5 and Table 5.7.

The standardized coefficients β_1 through β_{11} were used as estimates of the direct

effects of the dimensions of Industry Globalization Potential (ADVANT, HOMOGE and

SCALE), Global Strategic Orientation (UNIROLE and OPEFLEX), Global

Interdependence (ITDPPHYS, ITDPINFO, ITDPHR, ITDPFIN) and Global

Correspondence (AGREE, COMPLY) on the mechanisms of the Global Organizational

Infrastructure. The significance levels of the coefficients β_6 through β_9 in each equation

were used to evaluate Proposition 3 and its related hypotheses while the coefficients β_{10}

and β_{11} were used to evaluate Proposition 4 and its related hypotheses. Adjusted R^2's

were used as indicators of the statistical power of the regression models.

The indirect effects of the dimensions of Industry Globalization Potential and

Global Strategic Orientation on the mechanisms of Global Organizational Infrastructure

represent those effects that are mediated by the intervening variables. The indirect effects were computed by multiplying all path coefficients (β) along an indirect route from the exogenous variable to the endogenous variable. Since more than one indirect path existed between any two variables of interest, the total indirect effect was reached by adding the indirect effects along all possible routes. Finally, total effects were computed by adding the direct effects and the indirect effects of the exogenous variable on the endogenous variable.

Table 5.5 – Regression Models – Global Org. Infrastructure (Vertical Coordination)

Model	Regression Analysis Equation
1	$BEHCTRL = \beta_0 + \beta_1 ADVANT + \beta_2 HOMOGE + \beta_3 SCALE + \beta_4 UNIROLE + \beta_5 OPEFLEX + \beta_6 ITDPPHYS + \beta_7 ITDPINFO + \beta_8 ITDPHR + \beta_9 ITDPFIN + \beta_{10} AGREE + \beta_{11} COMPLY$
2	$CENTRAL = \beta_0 + \beta_1 ADVANT + \beta_2 HOMOGE + \beta_3 SCALE + \beta_4 UNIROLE + \beta_5 OPEFLEX + \beta_6 ITDPPHYS + \beta_7 ITDPINFO + \beta_8 ITDPHR + \beta_9 ITDPFIN + \beta_{10} AGREE + \beta_{11} COMPLY$
3	$FORMAL = \beta_0 + \beta_1 ADVANT + \beta_2 HOMOGE + \beta_3 SCALE + \beta_4 UNIROLE + \beta_5 OPEFLEX + \beta_6 ITDPPHYS + \beta_7 ITDPINFO + \beta_8 ITDPHR + \beta_9 ITDPFIN + \beta_{10} AGREE + \beta_{11} COMPLY$
4	$OUTCTRL = \beta_0 + \beta_1 ADVANT + \beta_2 HOMOGE + \beta_3 SCALE + \beta_4 UNIROLE + \beta_5 OPEFLEX + \beta_6 ITDPPHYS + \beta_7 ITDPINFO + \beta_8 ITDPHR + \beta_9 ITDPFIN + \beta_{10} AGREE + \beta_{11} COMPLY$

Table 5.6 depicts the results for the regression models derived for the formal mechanisms of the Global Organizational Infrastructure. Proposition 4 and its derived hypotheses predicted a negative association between the levels of global correspondence and the extent to which the MNC's global organizational infrastructure incorporate mechanisms for vertical coordination. Although not all standardized coefficients (βs) were significant, our data analysis indicates that to some extent the levels of agreement among national units serve as predictors to the use of formal mechanisms by the MNC.

The levels of centralization and the extent of use of output control mechanisms are negatively associated with the levels of agreement among national units. Where common understanding and accord exist, national units usually enjoy greater autonomy in deciding their strategies and operating policies and the MNC monitors to a lesser extent the national units' performance. This is in agreement with our predictions.

Our results indicate, however, that a positive (rather than negative) relationship exists between the levels of formalization and behavioral control and the extent of national unit compliance to the strategies and guidelines set forth by the MNC. One possible explanation is that national unit compliance is achieved by establishing a comprehensive set of procedures and policies and by the monitoring the extent to which the national unit's follow them. In other words, rather than a predictor, compliance may be conceptualized as the product of the use of vertical mechanisms such as formalization and behavioral control by the MNC.

Table 5.6 – Predictors of the Global Org. Infrastructure – Mechanisms for Vertical Coordination

Predictors	BEHCTRL			CENTRAL			FORMAL			OUTCTRL		
	Direct Effect	Indirect Effect	Total Effect	Direct Effect	Indirect Effect	Total Effect	Direct Effect	Indirect Effect	Total Effect	Direct Effect	Indirect Effect	Total Effect
ADVANT	-.26**	.00	-.26**	-.08	.01	-.07	.02	.01	.03	.43***	.01	.44***
HOMOGE	.15	.00	.15	.13	.01	.14	-.12	.00	-.12	-.15	.00	-.15
SCALE	.14	.01	-.19*	.06	-.02	.04	.32***	.01	.33***	.01	.00	.01
UNIROLE	-.20*	.01	-.19*	-.12	.07	-.05	.02	-.02	.00	.16	-.09	.07
OPEFLEX	-.07	.00	-.07	.14	.11	.25**	-.18	.04	-.14	-.15	-.04	-.19*
ITDPPHYS	-.03			.15			-.01			.09		
ITDPINFO	.04			.29**			.11			-.22*		
ITDPHR	-.01			-.14			.17			-.06		
ITDPFIN	.02			.07			-.21*			-.05		
AGREE	-.15			-.24**			-.13			-.21*		
COMPLY	.41***			.01			.33**			.01		
Adjusted R^2	.19			.28			.11			.24		

* : $p < 0.10$ ** : $p < 0.05$ *** : $p < 0.01$

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Table 5.8 depicts the results for the regression models derived for the lateral

coordination mechanisms of the Global Organizational Infrastructure. Proposition 3 and

its derived hypotheses predicted a positive association between the levels of global

interdependence and the extent to which the MNC's global organizational infrastructure

incorporates mechanisms for lateral coordination.

In support to our predictions, the data analysis indicates that the levels of global

interdependence on information and human resources among national units is positively

associated with the use of mechanisms for lateral coordination by the MNC. The greater

and the more intense the flow of information and human resources among national units,

the more likely the MNC is to implement mechanisms fostering interactions among

managers. It is also more likely to find common career paths and training programs in

MNCs where high levels of information exchange among national units exist.

However, the results indicate that, although global interdependence on financial

resources is associated with the levels of informal communications and socialization

across national units of the MNC, the relationship is negative rather than positive. One

plausible explanation for the negative relationship lies on the motivation for the exchange

of financial resources by the national units of the MNC. The international strategy

literature usually refers to the flow of financial resources in situations where there is an

unfavorable environment for the MNC and its national units. These unfavorable

conditions come in the form of greater competition, fluctuations in exchange rates,

economic and political instability, etc. All these factors contribute to the weakened

position of the MNC. The increased flow of financial resources among national units

might therefore be viewed as a reactive attempt of the MNC to reduce this weakened

position. Under such situations, we therefore should not expect to find strong levels of

investment in coordinating mechanisms. Priorities are set on more urging issues.

Table 5.7 – Regression Models – Global Org. Infrastructure (Lateral Coordination)

Model	Regression Analysis Equation
1	$INFCOM = \beta_0 + \beta_1 ADVANT + \beta_2 HOMOGE + \beta_3 SCALE +$ $\beta_4 UNIROLE + \beta_5 OPEFLEX +$ $\beta_6 ITDPPHYS + \beta_7 ITDPINFO + \beta_8 ITDPHR + \beta_9 ITDPFIN +$ $\beta_{10} AGREE + \beta_{11} COMPLY$
2	$SOCIAL = \beta_0 + \beta_1 ADVANT + \beta_2 HOMOGE + \beta_3 SCALE +$ $\beta_4 UNIROLE + \beta_5 OPEFLEX +$ $\beta_6 ITDPPHYS + \beta_7 ITDPINFO + \beta_8 ITDPHR + \beta_9 ITDPFIN +$ $\beta_{10} AGREE + \beta_{11} COMPLY$

Table 5.8 – Predictors of the Global Org. Infrastructure – Lateral Coordination

Predictors	INFCOM			SOCIAL		
	Direct Effect	Indirect Effect	Total Effect	Direct Effect	Indirect Effect	Total Effect
ADVANT	-.37***	.01	-.36***	-.05	.01	-.04
HOMOGE	-.10	.00	-.10	.06	.01	.07
SCALE	.01	-.01	.00	-.41***	-.01	-.42***
UNIROLE	-.10	-.01	-.12	.08	.01	.09
OPEFLEX	.14	.07	.21*	.21*	.08	.29**
ITDPPHYS	-.05			-.08		
ITDPINFO	.27**			.37***		
ITDPHR	.18*			.13		
ITDPFIN	-.29***			-.27**		
AGREE	-.01			.05		
COMPLY	.41***			.20		
Adjusted R^2	.40			.27		

* : $p < 0.10$ ** : $p < 0.05$ *** : $p < 0.01$

5.5 Predictors of the Global IT Infrastructure

The effects on the capabilities of the Global IT Infrastructure were analyzed by including the dimensions of Global Interdependence, Global Correspondence, Global Strategic Orientation and Industry Globalization Potential in the regression equations as independent variables. Each of the variables used to measure the Global IT Infrastructure was added to the model as the dependent variable of interest. The variables used to

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measure the capabilities of the Global IT Infrastructure were categorized as follows (the table depicting the associated regression model is in parenthesis):

- Planning of the Global IT Infrastructure (Table 5.9)

  - Platform Compatibility Planning (PLNPLAT)

  - Data Transparency Planning (PLNDAT)

  - Network Connectivity Planning (PLNNET)

- Reach of the Global IT Infrastructure (Table 5.11)

  - Platform Compatibility Reach (RCHPLAT)

  - Data Transparency Planning (RCHDAT)

  - Network Connectivity Planning (RCHNET)

- Range of the Global IT Infrastructure (Table 5.13)

  - Platform Compatibility Planning (RNGPLAT)

  - Data Transparency Planning (RNGDAT)

  - Network Connectivity Planning (RNGNET)

- Support Services of the Global IT Infrastructure (Table 5.15)

  - Primary Support Services (SVCPRI)

  - Secondary Support Services (SVCSEC)

The standardized coefficients β_1 through β_{11} were used as estimates of the direct effects of the dimensions of Industry Globalization Potential (ADVANT, HOMOGE and SCALE), Global Strategic Orientation (UNIROLE and OPEFLEX), Global Interdependence (ITDPPHYS, ITDPINFO, ITDPHR, ITDPFIN) and Global Correspondence (AGREE, COMPLY) on the variables measuring the Global IT Infrastructure. The significance levels of the coefficients β_6 through β_9 in each equation

were used to evaluate Proposition 5 and its related hypotheses while the coefficients β_{10} and β_{11} were used to evaluate Proposition 6 and its related hypotheses. Adjusted R^2's were used as indicators of the statistical power of the regression models.

Similarly to the analysis for the Global Organizational Infrastructure, indirect effects were computed by multiplying all path coefficients (β) along an indirect route from the exogenous variable to the endogenous variable. Since more than one indirect path existed between the variables of interest, the total indirect effect was reached by adding the indirect effects along all possible routes. Total effects were computed by adding the direct effects and the indirect effects of the exogenous variable on the endogenous variable.

Table 5.10 contains the results testing the relationship between the levels of global interdependence and the extent of planning of the Global IT Infrastructure maintained by the MNC. Proposition 5 and the related hypotheses predicted that an increase in the levels of global interdependence or flow of physical, information, human and financial resources would be followed by an increase in the scope and intensity of planning activities for the several components of the Global IT Infrastructure. Our results suggest that, in general, the global interdependence on information and human resources positively affect the planning of the capabilities to be offered by the Global IT Infrastructure. Specifically, global interdependence on information is associated with more extensive planning activities for platform compatibility and network connectivity. Global interdependence on human resources was found to be positively associated with the planning activities for data transparency and network connectivity in the Global IT Infrastructure. These results suggest that a more extensive exchange of human resources

among national units create requirements for more integrated data and for more comprehensive connectivity among national units. The Global IT Infrastructure therefore aims at providing support to the human resources dedicated at managing the interdependent activities of national units.

No relationship was found between the levels of physical resources exchange and the planning of the Global IT Infrastructure. In addition, the relationship between the global interdependence on financial resources and the planning of network connectivity among national units, although significant, was found to be negative.

Table 5.9 – Regression Models – Planning of Global IT Infrastructure

Model	Regression Analysis Equation
1	$PLNPLAT = \beta_0 + \beta_1 ADVANT + \beta_2 HOMOGE + \beta_3 SCALE + \beta_4 UNIROLE + \beta_5 OPEFLEX + \beta_6 ITDPPHYS + \beta_7 ITDPINFO + \beta_8 ITDPHR + \beta_9 ITDPFIN + \beta_{10} AGREE + \beta_{11} COMPLY$
2	$PLNDAT = \beta_0 + \beta_1 ADVANT + \beta_2 HOMOGE + \beta_3 SCALE + \beta_4 UNIROLE + \beta_5 OPEFLEX + \beta_6 ITDPPHYS + \beta_7 ITDPINFO + \beta_8 ITDPHR + \beta_9 ITDPFIN + \beta_{10} AGREE + \beta_{11} COMPLY$
3	$PLNNET = \beta_0 + \beta_1 ADVANT + \beta_2 HOMOGE + \beta_3 SCALE + \beta_4 UNIROLE + \beta_5 OPEFLEX + \beta_6 ITDPPHYS + \beta_7 ITDPINFO + \beta_8 ITDPHR + \beta_9 ITDPFIN + \beta_{10} AGREE + \beta_{11} COMPLY$

Table 5.10 – Predictors of the Global IT Infrastructure – Planning

Predictors	PLNPLAT			PLNDAT			PLNNET		
	Direct Effect	Indirect Effect	Total Effect	Direct Effect	Indirect Effect	Total Effect	Direct Effect	Indirect Effect	Total Effect
ADVANT	-.27**	.01	-.26**	-.20*	.00	-.20*	-.43***	.01	-.42***
HOMOGE	-.23**	.00	-.23**	-.17	.01	-.16	-.31***	.00	-.31***
SCALE	.28**	-.01	-.27**	.17	-.01	.16	.19*	.00	.19*
UNIROLE	-.03	.02	-.01	-.33**	.06	-.27**	-.10	.00	-.10
OPEFLEX	-.20	.07	-.13	-.11	.07	-.04	-.08	.06	-.02
ITDPPHYS	.01			.03			-.05		
ITDPINFO	.22*			.16			.24**		
ITDPHR	.14			.23**			.21**		
ITDPFIN	-.17			-.10			-.25**		
AGREE	-.18			-.26**			-.02		
COMPLY	.23			.21			.23*		
Adjusted R^2	.12			.11			.26		

* : $p < 0.10$ ** : $p < 0.05$ *** : $p < 0.01$

Table 5.11 – Regression Models – Range of Global IT Infrastructure

Model	Regression Analysis Equation
1	$RNGNET = \beta_0 + \beta_1 ADVANT + \beta_2 HOMOGE + \beta_3 SCALE + \beta_4 UNIROLE + \beta_5 OPEFLEX + \beta_6 ITDPPHYS + \beta_7 ITDPINFO + \beta_8 ITDPHR + \beta_9 ITDPFIN + \beta_{10} AGREE + \beta_{11} COMPLY$
2	$RNGDAT = \beta_0 + \beta_1 ADVANT + \beta_2 HOMOGE + \beta_3 SCALE + \beta_4 UNIROLE + \beta_5 OPEFLEX + \beta_6 ITDPPHYS + \beta_7 ITDPINFO + \beta_8 ITDPHR + \beta_9 ITDPFIN + \beta_{10} AGREE + \beta_{11} COMPLY$
2	$RNGPLAT = \beta_0 + \beta_1 ADVANT + \beta_2 HOMOGE + \beta_3 SCALE + \beta_4 UNIROLE + \beta_5 OPEFLEX + \beta_6 ITDPPHYS + \beta_7 ITDPINFO + \beta_8 ITDPHR + \beta_9 ITDPFIN + \beta_{10} AGREE + \beta_{11} COMPLY$

Table 5.12 contains the results of the regression models for the Range of the

Global IT Infrastructure. The results suggest that the extent of network connectivity, data

transparency, and platform connectivity found in a multinational organization is in

general associated only with the levels of global interdependence on human resources

maintained by the national units. No relationship was found between the global

interdependence on physical, information, and financial resources and the range of the

global IT infrastructure. This result seems to indicate that currently the global IT

infrastructure primarily supports the movement of human resources among national units

and does not play a major role in coordinating the flow of resources other than human.

We will discuss this further in the last section of this chapter.

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Table 5.12 – Predictors of the Global IT Infrastructure – Range

Predictors	RNGNET Direct Effect	Indirect Effect	Total Effect	RNGDAT Direct Effect	Indirect Effect	Total Effect	RNGPLAT Direct Effect	Indirect Effect	Total Effect
ADVANT	-.30***	.01	-.29**	-.42***	-.01	-.43***	-.13	.01	-.12
HOMOGE	-.02	.01	-.01	-.19*	.00	-.19*	-.04	.01	-.03
SCALE	.11	-.02	-.09	.28**	-.01	-.27**	.12	-.02	.10
UNIROLE	-.43***	.06	-.37***	-.34***	.11	-.23*	-.29**	.06	.23*
OPEFLEX	.04	.12	.16	-.11	.07	-.04	-.14	.13	.01
ITDPPHYS	.06			.01			.19		
ITDPINFO	.17			.08			.07		
ITDPHR	.39***			.32***			.30***		
ITDPFIN	-.18			.02			-.09		
AGREE	.13			-.07			-.08		
COMPLY	.08			.22			.31**		
Adjusted R^2	.28			.20			.12		

$*: p < 0.10 \quad **: p < 0.05 \quad ***: p < 0.01$

Table 5.13 – Regression Models – Reach of Global IT Infrastructure

Model	Regression Analysis Equation
1	$RCHNET = \beta_0 + \beta_1 ADVANT + \beta_2 HOMOGE + \beta_3 SCALE + \beta_4 UNIROLE + \beta_5 OPEFLEX + \beta_6 ITDPPHYS + \beta_7 ITDPINFO + \beta_8 ITDPHR + \beta_9 ITDPFIN + \beta_{10} AGREE + \beta_{11} COMPLY$
2	$RCHDAT = \beta_0 + \beta_1 ADVANT + \beta_2 HOMOGE + \beta_3 SCALE + \beta_4 UNIROLE + \beta_5 OPEFLEX + \beta_6 ITDPPHYS + \beta_7 ITDPINFO + \beta_8 ITDPHR + \beta_9 ITDPFIN + \beta_{10} AGREE + \beta_{11} COMPLY$
3	$RCHPLAT = \beta_0 + \beta_1 ADVANT + \beta_2 HOMOGE + \beta_3 SCALE + \beta_4 UNIROLE + \beta_5 OPEFLEX + \beta_6 ITDPPHYS + \beta_7 ITDPINFO + \beta_8 ITDPHR + \beta_9 ITDPFIN + \beta_{10} AGREE + \beta_{11} COMPLY$

Table 5.14 depicts the results of the regression models for the reach of the Global IT Infrastructure. The results are very similar to the results for the range of the Global IT Infrastructure, reinforcing the pattern of association between the levels of Global Interdependence on human resources and the capabilities offered by the Global IT Infrastructure. Our results suggests that network connectivity, data transparency and platform compatibility tend to be present in a larger number of national units when the levels of human resources exchange among national units is higher. Our observations indicate that the development of a Global IT Infrastructure is driven by the need of providing support to personnel travelling across national units. The exchange of human resources across national units creates the need for transparent access to information across as many national units as possible under compatible platforms.

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We also found that an attempt towards data integration across a larger number of national units is more likely to occur in multinational organizations that maintain high global interdependence on physical resources. Consistent or "translatable" data must be present in larger number national units to facilitate the flow of physical resources.

Table 5.14 – Predictors of the Global IT Infrastructure – Reach

Predictors	RCHNET			RCHDAT			RCHPLAT		
	Direct Effect	Indirect Effect	Total Effect	Direct Effect	Indirect Effect	Total Effect	Direct Effect	Indirect Effect	Total Effect
ADVANT	-.35***	.01	-.34***	-.17	.02	-.15	-.16	.01	-.15
HOMOGE	-.19*	.00	-.19*	-.20*	.01	-.19	-.21*	.01	-.20*
SCALE	.11	-.02	.09	.23**	-.02	.21*	.21*	-.02	.19
UNIROLE	-.27**	.09	-.18	-.31**	.04	-.27**	-.19	.07	-.12
OPEFLEX	-.02	.13	.11	-.02	.14	.12	-.19	.13	-.06
ITDPPHYS	.05			.24**			.12		
ITDPINFO	.23*			.08			.15		
ITDPHR	.40***			.28**			.37***		
ITDPFIN	-.16			-.14			-.15		
AGREE	.15			-.05			.04		
COMPLY	.10			.13			.31**		
Adjusted R^2	.25			.17			.21		

* : $p < 0.10$ ** : $p < 0.05$ *** : $p < 0.01$

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Table 5.15 – Regression Models – Support Services of Global IT Infrastructure

Model	Regression Analysis Equation
1	$SVCPRI = \beta_0 + \beta_1 ADVANT + \beta_2 HOMOGE + \beta_3 SCALE + \beta_4 UNIROLE + \beta_5 OPEFLEX + \beta_6 ITDPPHYS + \beta_7 ITDPINFO + \beta_8 ITDPHR + \beta_9 ITDPFIN + \beta_{10} AGREE + \beta_{11} COMPLY$
2	$SVCSEC = \beta_0 + \beta_1 ADVANT + \beta_2 HOMOGE + \beta_3 SCALE + \beta_4 UNIROLE + \beta_5 OPEFLEX + \beta_6 ITDPPHYS + \beta_7 ITDPINFO + \beta_8 ITDPHR + \beta_9 ITDPFIN + \beta_{10} AGREE + \beta_{11} COMPLY$

Table 5.16 provides us with the results of the regression models for the levels of support services offered by the Global IT Infrastructure. Consistent with our previous findings, the levels of Global Interdependence on human resources among national units is positively associated with the extent of both primary and secondary services provided by the corporate IT function in support of the Global IT Infrastructure. The more intense the flow of human resources among national units, the greater the responsibility of a centralized IT group for offering primary and secondary support services. The results also suggest that the levels of global interdependence on physical resources have a positive impact on the offering of secondary support services by a central IT group. No relationship was found between the levels of global interdependence on information and financial resources and the levels of support services to the Global IT Infrastructure.

The results seem to consistently indicate that the levels of human resources exchange is the primary factor driving the capabilities of the Global IT Infrastructure. Other types of resource flows are either marginal predictors or unrelated to the properties

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of the Global IT Infrastructure. In the next section, we take a broader perspective of the results in an attempt to assess our original model in light of our findings.

Table 5.16 – Predictors of the Global IT Infrastructure – Support Services

Predictors	SVCPRI			SVCSEC		
	Direct Effect	Indirect Effect	Total Effect	Direct Effect	Indirect Effect	Total Effect
ADVANT	-.37***	.01	-.36***	-.27**	.00	-.27**
HOMOGE	-.21*	.00	-.21*	-.23*	.01	-.22*
SCALE	-.03	-.02	-.05	.21*	-.02	.19
UNIROLE	-.24*	.07	.17	-.26**	.13	-.13
OPEFLEX	.04	.12	.16	-.17	.14	-.03
ITDPPHYS	.15			.21*		
ITDPINFO	.06			.06		
ITDPHR	.36***			.29**		
ITDPFIN	-.10			.08		
AGREE	-.13			.03		
COMPLY	.15			.04		
Adjusted R^2	.12			.12		

* : $p < 0.10$ ** : $p < 0.05$ *** : $p < 0.01$

5.6 Research Findings Discussion

This study did not find support for the proposition suggesting a positive relationship between industry drivers for globalization and the global strategic orientation adopted by the firm. This result contradicts previous research that suggested industry environment as a key driver for a firm's disposition to adopting a global strategy.

Although methodological limitations of the study (to be described in the next chapter) may be a possible explanation for these results, there could be alternative explanations.

The effects of industry may have been swamped by the general, cross industry trend towards globalization. Although industry played a major role in the initial years, the phenomenon of globalization may have presented firms with a "global imperative" that was not solely driven by the specific requirements of the industry. The global imperative could be driven by firm's opportunistic leveraging of "windows of opportunity" presented by the larger environment. For example, Merrill Lynch has recently embarked on strategy to increase its presence in the South East Asian financial markets to take advantage of the radical restructuring of the financial services industry in Thailand, Korea, Malaysia and Japan in the wake of the Asian crisis. Although strong differences in market regulations and financial industry structures had constrained the potential for globalizing, the Asian crisis opened up opportunities that Merrill Lynch could leverage based on its existing reputation and expertise. Another potential driver for global strategic orientation may be streamlining of international trade by the formation of global trade institutions/coalitions such as the European Community, NAFTA and MERCOSUL which increase the incentives for firms to engage in international trade. Furthermore, management's own perceptions of the benefits globalization caused by the "media hype" around globalizations may also explain the general trend towards globalization.

An alternative explanation for lack of support for relationship between the industry and firm's strategy is the fact that this study is a "descriptive" study, while the proposed relationship is based on a "prescriptive" logic. The global strategic orientation

measures the strategy adopted by the firm's management and not necessarily the strategy that firm should have adopted, given the industry's potential for globalization.

In contrast to the previous relationship, this study found strong support for the linkage between the extent to which the MNC pursues a global strategic orientation and the levels of global interdependence among national units. This result supports a central premise of this study that global interdependence could serve as an intervening variable, between strategy and the coordination mechanisms used by the multinational firm. The lack of an intervening variable may also explain the paucity of empirical evidence supporting the Global Strategy-IT infrastructure linkage.

Using the concepts of interdependence and correspondence borrowed from organizational theory, we also proposed that these two concepts would provide the basis on which mechanisms to coordinate and control the MNC's operations are developed. Our predictions were that levels of global interdependence would be more closely associated with mechanisms for lateral coordination and that global correspondence (or the lack of it) would be more closely associated with mechanism for vertical coordination or control. Although our results did not provide strong support for these propositions, they do indicate a pattern that corroborates with these propositions. While the levels of global interdependence in almost all cases did not impact the use of mechanisms for vertical control, the levels of global correspondence were more closely associated with the extent of use of these mechanisms. Similarly, the levels of global interdependence were more closely associated with mechanisms to facilitate lateral communication than the levels of global correspondence. The above findings are promising enough to encourage a further investigation in this area.

We also predicted in our study that the intervening variable of global interdependence would be able to better explain the linkage between global strategic orientation and the capabilities offered by the global IT infrastructure. The study demonstrated that the relationship between global interdependence and the characteristics of the global IT infrastructure holds true mainly in two areas:

1. Global Interdependence on Human Resources and the capabilities (reach, range, and support services) of the Global IT Infrastructure

2. Global Interdependence on Human Resources and Information and the Planning of the Global IT Infrastructure

The flow of people across national units of the MNC was found to have a significant and positive impact on the reach, range, and level of support services offered by the global IT infrastructure. This result suggests that the increased flow of people across the MNC has prompted the firm to develop a set of shared IT capabilities to support the information needs of these human resources. Managers travelling across borders had to be provided with a set of shared IT capabilities that allowed them to perform their tasks in an efficiently and effectively. For example, data was standardized across units for easier understanding and interpretation of human resources visiting these units. Similarly, network connectivity was made available for easier and faster communication of managers visiting different national units of the MNC. In this sense, the needs and requirements of these human resources moving across national units is the main motivator for the development of a Global IT Infrastructure.

The lack of support to the association between other resource flows and the capabilities offered by the Global IT Infrastructure also seem to indicate a lack of

integration between the global business requirements and the IT services and capabilities delivered by the IS function. The results seem to suggest that the IS function needs to connect more closely and better understand the business context in which the globally integrated operations take place.

The findings regarding the association between Global Interdependence and the Planning of the Global IT Infrastructure corroborate our point that the lack of a strong relationship between Global Interdependence and the capabilities of the Global IT Infrastructure reflect the need for better coupling between the IS function and the MNC's business requirements. Our study found stronger support to the linkage between Global Interdependence on both Human and Information Resources and the Planning of the Global IT Infrastructure. This stronger association indicates that the IS function is currently undergoing an effort aiming at the better understanding of the firm's global business requirements. Once these plans are translated into capabilities, we should find a closer fit between global interdependence and the reach, range, and the level of support services offered by the global IT infrastructure.

Future studies will have to confirm our results and test our explanations for those associations that did not find support in our study. However, we believe that we have contributed by providing a new approach on which to further pursue our understanding of process of global integration and the role of the global IT infrastructure in this process. The next chapter will explore in more detail the contributions and limitations of our study.

CHAPTER 6

Limitations and Contributions

6.1 Limitations

The generalizability of the research findings and practical prescriptions need to be qualified by a number of limitations of the study. Firstly, the results of the study may be limited to medium to large sized US multinational corporations operating in the manufacturing sector. Extensions to multinational firms with small number of units, operating in the service sector or based in countries other than the United States would be highly speculative.

Second, our results are based on a sample of 94 multinational corporations. The range of values for the adjusted R^2's presented in the analysis of the results indicates the low statistical power of our tests, affected mainly by the relatively small sample size. We therefore must take the results of our research as tentative rather than conclusive.

Still with respect to the analysis presented, one should also consider the limitations of the statistical methods used to test the model. The regression analyses performed do not account for the fact that in a equation a variable enters as an endogenous factor while in other equations the same variable enters as an exogenous factor. This might violate assumptions regarding error in the variable as described by Johnston (1963). While more powerful methods such as structural equation modeling

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(SEM) might take care of this issue, we were not able to apply them due to our relative small sample size.

Although we were able to establish acceptable validity and reliability properties for most of the measures of our constructs, sample size issues can not be ignored when interpreting our measurement analysis results. Several items of both questionnaires had to be discarded for failing to demonstrate appropriate clustering properties. In addition, some other items did not cluster as expected, even though they demonstrated a clustering structure comprising of a single factor. Future research using larger sample sizes will be necessary to confirm and validate the measurement properties of our items.

Regarding the reliability of our measures, of particular concern are the measures of industry globalization potential. Measures for the economies of scale and comparative advantages dimensions had their Cronbach's Alpha below the .70 minimum suggested by Nunnally (1978). This prompts us to take with caution all results involving these two dimensions. In special, the results that industry globalization potential had no effects on the global strategic orientation of the MNC may have been confounded by these measurement problems.

Another limitation of this study relies on its cross-sectional nature, ignoring time-related effects. As discussed before, the results seem to indicate that the capabilities offered by the Global IT Infrastructure are the product of an organizational process, in which strategy, structure, environment interact in a complex way over time to shape and define the capabilities offered by the Global IT Infrastructure. However, this observation is only speculative, given the cross-sectional nature of the study. Future research should

be designed using methods that allow for a longitudinal, time-based perspective on the relationships between the constructs here explored.

6.2 Contributions

An important aspect of this dissertation lies on its ability to investigate issues related to global integration in multinational corporations and the deployment of a global IT infrastructure from a perspective not before explored. The discussion below describes the contributions of this study to theory, methods, and practice.

6.2.1 Theoretical Contributions

Despite the widely recognized importance of global integration, there is a lack of a comprehensive conceptual framework that addresses all relevant aspects of the multinational corporation for the study of global integration. Before further studies on global integration can be undertaken, we must first establish a clear understanding of what constitutes this complex construct. This study contributes to research in this area by providing a conceptualization of global integration that brings together several important aspects the multinational corporation. Using concepts borrowed from organization theory, we provided a framework that takes into consideration the MNC's internal and external environment, strategy, structure, and the administrative tools used to manage the firm's global operations. While future research can further explore the relationships among these concepts, our study offered new directions and questioned linkages considered already established in the literature.

We proposed global interdependence as a mediating construct to explain the characteristics technical and non-technical infrastructure developed by the MNC to implement a strategy of global integration. Global interdependence captures the structural relationships among national units that comprise the multinational organization and reflects the state of the organization after management's decisions with respect to global integration. The support found in this study to the linkage between the firm's global strategic orientation and the levels of global interdependence provides us with a more reliable and enduring way of capturing the requirements of the global strategic orientation adopted by the MNC. The concept of global interdependence clearly contributes to theory development by providing a new perspective on which to study the infrastructure design in multinational corporations. It provides an innovative starting point for more systematic investigation between the requirements of global integration and the capabilities that must be present in the organizational and technological infrastructures.

The literature has in the past established the linkage between the industry drivers of globalization and the MNC's global strategic orientation. While this linkage might still hold true for some multinational organizations, our study suggests that the process of global integration is no longer driven by the industry in which the MNC operates. We therefore contribute by directing our attention to the need of revisiting these previously established relationships. We need to rebuild our understanding of what drives multinational organizations to initiate a process of global integration by incorporating variables that go beyond the direct environment faced by the MNC.

This study also contributes by incorporating the information technology infrastructure aspect into the framework of global integration in multinational

corporations. By explicitly taking into consideration the characteristics of the global IT infrastructure, this study accounts for a vital aspect of the MNC that has been neglected in large by the literature on global integration. The global IT infrastructure provides the foundation on which technological capabilities can be built to support the complex pattern of interactions among national units of the globally integrated MNC. This study contributes by bringing together both the technological and administrative aspects of the MNC infrastructure. While future research might explore in more detail the intrinsic relationships between global IT and organizational infrastructures, this study took the first step in this direction by establishing the relationship between the capabilities offered by the two infrastructures and the requirements posited by the levels of global interdependence.

Still with respect to the IT aspect of global integration, this study offered a conceptualization of the global IT infrastructure that can be applied to future research. Borrowing from the literature on IT infrastructure, this study extended the concepts of reach, range, planning, and support services to the context of multinational corporations. By framing the network, data, and platform components of the global IT infrastructure along these concepts, we have provided an useful way of incorporating the technology aspect of the MNC's infrastructure to the study of global integration.

6.2.2   Methodological Contributions

A significant methodological contribution of this study is the development of an instrument for measuring global interdependence. This is the first instrument that systematically assesses the flows of physical, information, human, and financial

resources among national units of the MNC. The instrument exhibited acceptable validity and reliability properties and established the singular facet of the construct. The good indications of reliability and validity of the instrument should serve as an extra motivator for the further investigation and use of the concept of global interdependence by researchers of global integration.

A related significant contribution of this study is the development of an instrument for measuring the capabilities of the global IT infrastructure. This is the first instrument that has been systematically adapted and validated to the context of multinational corporations. The instrument captures the planning, reach, range, and support services for networks, data, and platforms that comprise the global IT infrastructure. The instrument exhibits acceptable validity and reliability properties, enabling the incorporation of the technological aspect to the study of global integration in multinational corporations.

The use of multiple respondents enhanced the overall quality of the study by relying on the appropriate respondents for the several aspects being measured. It also helped reduce the effects of common source bias. The overall methodology employed for guaranteeing matched responses proved to be very effective (72% of matched responses) and serves as a contribution for future research considering the employment of multiple respondents.

With respect to the survey method, the data collection procedures contributed to the methodology by elucidating the need to develop new ways of approaching our target respondents, especially if they are top executives of large corporations. From phone calls and declining letters, it became clear that these top executives are frequently being

bombarded with surveys. This unprecedentedly large number of requests has led to formal policies prohibiting the answer of surveys or informal decisions on the part of the respondents of not participating in survey studies. We must therefore reconsider our data collection strategies in order to make effective use of our research resources and guarantee a successful response rate.

6.2.3   Practical Contributions

This study makes important contributions to the managers of multinational corporations contemplating global integration efforts. The instruments developed can serve as metrics for their organizations' global strategic orientation, global interdependence, global correspondence and global IT and organizational infrastructures. Using these instruments, managers of MNCs should be able to establish the requirements and assess the firm's capabilities for pursuing globally integrated operations. Such an assessment would identify the potential opportunities and problems in the MNC's IT and organizational infrastructure and help to plan and implement corrective actions so as to effectively fit the capabilities and the requirements of the multinational organization with respect to the levels of global integration.

6.3   Future Research

This study is another step taken in understanding the complex relationships governing the development of a global IT infrastructure to support the process of global integration in multination organizations. Although several insights were gained from our

exercise, there are a number of directions that can be taken in further pursuing an ample understanding of the role of IT in the process of global integration.

First, this study posited questions to the established theories and general expectations around the relationships studied. Our results produced several results that go against some of the well-established concepts in the international strategy literature. IT did not find any support to the general idea that the global characteristics of an industry determine the global strategic orientation of firms within that industry. Although that might be case for some firms, our study indicate that a posture of global integration may be taken (or not taken) by the multinational organization, irrespective of the industry in which it operates. Further studies should explore the drivers of global integration in a broader fashion, not limiting its scope to only those drivers related to characteristics of the external environment in which the MNC operates.

We believe the relationship the global interdependence among national units and the characteristics of the global IT infrastructure might be the product of a complex interaction process that develops over time and is influenced by several other factors such as the firm's external and internal environment, strategy, and structure. Our results should illuminate directions to be taken by future studies further exploring the relationship between global interdependence and global IT infrastructure.

Our study relied solely on a cross-sectional survey. Future studies will gain richer insights by using other research methods, such as case studies, that allow the observation of these relationships over a period of time. The same holds true for the relationship between the strategic orientation adopted by the firm and the levels of global interdependence.

Another opportunity for future research is the extension of this study to firms operating in the services sector. The nature of their operations presents a different context for testing the relationships of concern to this study and would allow us to contrast the results against those found here for firms operating in the manufacturing sector.

An important contribution of this study was the development of measures for global interdependence and the capabilities of the global IT infrastructure. Although we were able to demonstrate acceptable validity and reliability properties for these measures, our relatively small sample size does not allow us to assure the quality and strength of our measures. Future research could employ the instruments developed here to test samples with different characteristics (e.g., non-US MNCs) and even from other non-global contexts (after some adaptation) in an attempt to further validate the instruments and increase their applicability.

Appendices

Appendix A – Hypotheses Derived from Propositions

The following enumerates the hypotheses that may be generated from the five propositions of the study.

Proposition 1: Industry Globalization Potential and Global Strategic Orientation

H1.1:   The MNC's global market participation is positively associated with the market homogenization of the industry.

H1.2:   The MNC's global marketing approach is positively associated with the market homogenization of the industry.

H1.3:   The global role of the MNC's national units is positively associated with the market homogenization of the industry.

H1.4:   The MNC's global competitive moves are positively associated with the market homogenization of the industry.

H1.5:   The MNC's global operational flexibility is positively associated with the economies of scale of the industry.

H1.6:   The MNC's global market participation is positively associated with the economies of scale of the industry.

H1.7:   The MNC's global marketing approach is positively associated with the economies of scale of the industry.

H1.8:   The global role of the MNC's national units is positively associated with the economies of scale of the industry.

H1.9:   The MNC's global competitive moves are positively associated with the economies of scale of the industry.

H1.10: The MNC's global operational flexibility is positively associated with the economies of scale of the industry.

H1.11: The MNC's global market participation is positively associated with the comparative advantages of the industry.

H1.12: The MNC's global marketing approach is positively associated with the comparative advantages of the industry.

H1.13: The global role of the MNC's national units is positively associated with the comparative advantages of the industry.

H1.14: The MNC's global competitive moves are positively associated with the comparative advantages of the industry.

H1.15: The MNC's global operational flexibility is positively associated with the comparative advantages of the industry.

H1.16: The MNC's global market participation is positively associated with the technological intensity of the industry.

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H1.17: The MNC's global marketing approach is positively associated with the technological intensity of the industry.

H1.18: The global role of the MNC's national units is positively associated with the technological intensity of the industry.

H1.19: The MNC's global competitive moves are positively associated with the technological intensity of the industry.

H1.20: The MNC's global operational flexibility is positively associated with the technological intensity of the industry.

Proposition 2: Global Strategic Orientation and Global Interdependence

H2.1: The MNC's global interdependence is positively associated with its global market participation.

H2.2: The MNC's global interdependence is positively associated with its global marketing approach.

H2.3: The MNC's global interdependence is positively associated with the national role of its national units.

H2.4: The MNC's global interdependence is positively associated with its global competitive moves.

H2.5: The MNC's global interdependence is positively associated with its global operational flexibility.

Proposition 3: Global Interdependence and Mechanisms for Lateral Coordination of the Global Organizational Infrastructure

H3.1: The extent of use of lateral relation mechanisms by the MNC is positively associated with its levels of global interdependence.

H3.2: The extent of use of informal communication mechanisms by the MNC is positively associated with its levels of global interdependence.

H3.3: The extent of use of socialization mechanisms by the MNC is positively associated with its levels of global interdependence.

Proposition 4: Global Correspondence and Mechanisms for Vertical Coordination of the Global Organizational Infrastructure

H4.1: The levels of centralization are negatively associated with the levels of global correspondence.

H4.2: The levels of formalization are negatively associated with the levels of global correspondence.

H4.3: The extent of use of output control mechanisms is negatively associated with the levels of global correspondence.

H4.4: The extent of use of behavioral control mechanisms is negatively associated with the levels of global correspondence.

Proposition 5a: Global Interdependence and the Range of the Global IT Infrastructure

H5a.1: The range of network connectivity is positively associated with the MNC's global interdependence.

H5a.2: The range of data transparency is positively associated with the MNC's global interdependence.

H5a.3: The range of platform interoperability is positively associated with the MNC's global interdependence.

Proposition 5b: Global Interdependence and the Reach of the Global IT Infrastructure

H5b.1: The reach of network connectivity is positively associated with the MNC's global interdependence.

H5b.2: The reach of data transparency is positively associated with the MNC's global interdependence.

H5b.3: The reach of platform interoperability is positively associated with the MNC's global interdependence.

Proposition 5c: Global Interdependence and the Planning of the Global IT Infrastructure

H5c.1: The extent of planning for network connectivity is positively associated with the MNC's global interdependence.

H5c.2: The extent of planning for data transparency is positively associated with the MNC's global interdependence.

H5c.3: The extent of planning for platform interoperability is positively associated with the MNC's global interdependence.

Proposition 5d: Global Interdependence and the Support Services of the Global IT Infrastructure

H5d.1: The levels of primary support services for the Global IT infrastructure are positively associated with the MNC's global interdependence.

H5d.2: The levels of secondary support services for the Global IT infrastructure are positively associated with the MNC's global interdependence.

Appendix B – Cover Letters for the 1st Mailing

Letter to Non-IS Executive

<<Date>>

«NonIS_Salutation» «NonIS_FirstName» «NonIS_LastName»
«NonIS_JobTitle»
«Company»
«Address1»
«Address2»
«Address3»
«City», «State» «PostalCode»

Dear «NonIS_Salutation» «NonIS_LastName»,

Although information technology (IT) has enabled multinational organizations like yours to integrate worldwide units, so far we have only a sketchy idea of what drives the characteristics of the IT infrastructure supporting global operations. Without such understanding, IT investment decisions that effectively respond to the strategic needs of multinational organizations are difficult to formulate. The Joseph M. Katz Graduate School of Business and its International Business Center are conducting a study aimed at the resolution of these issues.

Since you are involved in the management of worldwide operations, your input is very important to the success of this study and we would like to enlist your help. The two enclosed questionnaires are intended to assess the organizational and IT infrastructure issues of interest. Executives in positions like yours have reviewed these questionnaires and found the contents to be of great value in developing a better understanding of how they should formulate IT investment choices. We would like for you to:

- Answer *Questionnaire A: The Organizational Assessment.*

- Forward *Questionnaire B: The Information Technology Assessment* and the accompanying cover letter to the executive in your firm administratively responsible for global IT resources.

Each questionnaire should take approximately 20 minutes to complete. The questionnaires have a control number to enable us to "match up" respondents and follow up on questionnaires that are not returned. However, we assure you that all responses will be kept strictly confidential and neither you nor your firm will be identified in any way.

Once the study is completed, you will receive, if you so desire, a customized executive report comparing your multinational organization to the aggregate results. In addition, the report will also include our recommendations about IT infrastructure investments and insights on the factors that influence the characteristics of the IT infrastructure.

Thank you for your assistance. Please do not hesitate to contact us in case you have any questions or concerns. We look forward to your participation in this study.

Sincerely,

William R. King   Paulo R. Flor
University Professor &   Project Director
Project Director   Phone: (412) 648-1716
Phone: (412) 648-1587

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Letter to IS Executive

TO: _____

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Forwarding Note: _____

<<Date>>

Dear Sir or Madam,

Although information technology (IT) has enabled multinational organizations like yours to integrate worldwide units, so far we have only a sketchy idea of what drives the characteristics of the IT infrastructure supporting global operations. Without such understanding, IT investment decisions that effectively respond to the strategic needs of multinational organizations are difficult to formulate. The Joseph M. Katz Graduate School of Business and its International Business Center are conducting a study aimed at the resolution of these issues.

Since you are involved in the management of global IT resources, your input is very important to the success of this study and we would like to enlist your help. Two questionnaires are intended to assess the organizational and IT aspects of interest. The executive in your firm responsible for global operations is answering *Questionnaire A: The Organizational Assessment.* We would like for you to answer the enclosed *Questionnaire B: The Information Technology Assessment,* which is being forwarded to you by your colleague. Executives in positions like yours have reviewed these questionnaires and found the contents to be of great value in developing a better understanding of how they should formulate investments in IT infrastructure.

The questionnaire being forwarded to you should take approximately 20 minutes to complete. The questionnaires have a control number to enable us to "match up" respondents and follow up on questionnaires that are not returned. However, we assure you that all responses will be kept strictly confidential and neither you nor your firm will be identified in any way.

Once the study is completed, you will receive, if you so desire, a customized executive report comparing your multinational organization to the aggregate results. In addition, the report will also include our recommendations about IT infrastructure investments and insights on the factors that influence the characteristics of the IT infrastructure.

Thank you for your assistance. Please do not hesitate to contact us in case you have any questions or concerns. We look forward to your participation in this study.

Sincerely,

William R. King
University Professor &
Project Director
Phone: (412) 648-1587

Paulo R. Flor
Project Director
Phone: (412) 648-1716

Appendix C – Reminder Card for 1st Mailing

Reminder Card to Non-IS Executive

University of Pittsburgh
Joseph M. Katz Graduate School of Business

Pittsburgh, Pennsylvania 15260
Paulo R. Flor, 259 Mervis Hall

«NonIS_Salutation» «NonIS_FirstName» «NonIS_LastName»
«NonIS_JobTitle»
«Company»
«Address1»
«Address2»
«Address3»
«City», «State» «PostalCode»

<<Date>>

About two weeks ago we requested your participation in the study *"Global Integration: Evaluating Requirements and Building Capabilities,"* being conducted by the Katz Graduate School of Business, University of Pittsburgh.

If you have already completed and returned *Questionnaire A: The Organizational Assessment* please accept our sincere thanks. If not, please do so today. Your input is extremely important for the success of our study seeking to understand the characteristics of the IT infrastructure in global organizations like yours.

We also ask you to contact the person to whom you forwarded *Questionnaire B: The Information Technology Assessment* and remind him/her to return that questionnaire. Both assessments are essential for a complete analysis of the issues.

If by some chance you did not receive the questionnaires, or they got misplaced, please call me at (412) 648-1716 and I will get another one in the mail to you.

Sincerely,

Paulo R. Flor
Project Director

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Appendix D – Cover Letters for 2nd Mailing

Cover Letter to Non-IS Executive (no response from both executives)

<<Date>>

«NonIS_Salutation» «NonIS_FirstName» «NonIS_LastName»
«NonIS_JobTitle»
«Company»
«Address1»
«Address2»
«Address3»
«City», «State» «PostalCode»

Dear «NonIS_Salutation» «NonIS_LastName»,

About a month ago we wrote to you seeking your assessment of issues that will help us understand what drives the characteristics of the information technology (IT) infrastructure in multinational organizations like yours. This study is being conducted by the Joseph M. Katz Graduate School of Business and its International Business Center.

We are writing to you because we sincerely believe that our results will provide you with useful and relevant insights on how to formulate IT investment decisions that effectively respond to the strategic needs of your multinational organization. Executives who have already returned their responses have found the contents to be of great value in stimulating their thinking on global integration and the related IT infrastructure issues. Furthermore, they are very interested in the customized report of the results, comparing the participating multinational organization to the final sample.

Since we have not yet received the completed set of questionnaires from your firm, we are enclosing new copies of the two questionnaires intended to assess the organizational and IT infrastructure issues of interest. We would like for you to:

- Answer *Questionnaire A: The Organizational Assessment.*
- Forward *Questionnaire B: The Information Technology Assessment* and the accompanying cover letter to the executive in your firm administratively responsible for global IT resources.

Each questionnaire should take approximately 20 minutes to complete. The questionnaires have a control number to enable us to "match up" respondents and follow up on questionnaires that are not returned. However, we assure you that all responses will be kept strictly confidential and neither you nor your firm will be identified in any way.

Once the study is completed, you will receive, if you so desire, the executive report comparing your multinational organization to the aggregate results. The report will also include IT infrastructure investment recommendations and insights on factors influencing the characteristics of the IT infrastructure.

Thank you for your assistance. Please do not hesitate to call us in case you have any questions or concerns. We look forward to your participation in this study.

Sincerely,

William R. King   Paulo R. Flor
University Professor &   Project Director
Project Director   (412) 648-1716
(412) 648-1587

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Cover Letter to IS Executive (no response from both executives)

TO: _____

Forwarding Note: _____

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<<Date>>

Dear Sir or Madam,

We hope you have received our earlier letter, sent about a month ago through your colleague, seeking your participation in a study aiming at the understanding of what drives the characteristics of the IT infrastructure in multinational organizations like yours. The study is being conducted by the Joseph M. Katz Graduate School of Business and its International Business Center.

We are writing to you again because we sincerely believe that our results will provide you with useful and relevant insights on how to formulate IT investment decisions that effectively respond to the strategic needs of your multinational organization. Executives who have already returned their responses have found the contents to be of great value in stimulating their thinking on global integration and the role of the IT infrastructure. Furthermore, they are very interested in the customized report of the results we will be providing, comparing the participating multinational organization to the final sample.

Since we have not yet received the completed set of questionnaires from your firm, we are enclosing a new copy of the questionnaire intended to assess the characteristics of the IT infrastructure in your multinational organization. The executive in your firm responsible for the management of global operations is answering *Questionnaire A: The Organizational Assessment.* The two will provide us with all data necessary for analysis.

This questionnaire should take approximately 20 minutes to complete. It has a control number to enable us to "match up" respondents and follow up on questionnaires that are not returned. However, we assure you that all responses will be kept strictly confidential and neither you nor your firm will be identified in any analysis.

Once the study is completed, you will receive, if you so desire, the executive report comparing your multinational organization against the aggregate results. The report will also include IT infrastructure investment recommendations and insights on factors influencing the characteristics of the IT infrastructure.

Thank you for your assistance. Please do not hesitate to call us in case you have any questions or concerns. We look forward to your participation in this study.

Sincerely,

William R. King
University Professor &
Project Director
(412) 648-1587

Paulo R. Flor
Project Director
(412) 648-1716

Cover Letter to a Referred IS Executive (no response from both executives)

<<Date>>

«IS_Salutation» «IS_FirstName» «IS_LastName»
«IS_JobTitle»
«Company»
«Address1»
«Address2»
«Address3»
«City», «State» «PostalCode»

Dear «IS_Salutation» «IS_LastName»,

We hope you have received our earlier letter, sent about a month ago through «NonIS_Salutation» «NonIS_FirstName» «NonIS_LastName», seeking your participation in a study aiming at the understanding of what drives the characteristics of the IT infrastructure in multinational organizations like yours. The study is being conducted by the Joseph M. Katz Graduate School of Business and its International Business Center.

We sincerely believe that our study will provide you with useful and relevant insights on how to formulate IT investment decisions that effectively respond to the strategic requirements of your multinational organization. Executives who have already returned their responses have found the contents to be of great value in stimulating their thinking on global integration and the enabling role of the IT infrastructure. Furthermore, they are very interested in the customized report of the results we will be providing, comparing the participating multinational organization to the final sample.

«NonIS_Salutation» «NonIS_LastName»'s office has indicated to us that you are involved in the management of global IT resources in your firm and we would like to enlist your help by answering the enclosed *Questionnaire B: The Information Technology Assessment.* The executive responsible for the management of global operations in your firm is answering *Questionnaire A: The Organizational Assessment.* Together, the two responses will provide us with all information necessary for the analysis of the issues.

The questionnaire should take approximately 15-20 minutes to complete. It has a control number to enable us to "match up" respondents and follow up on questionnaires that are not returned. However, we assure you that all responses will be kept strictly confidential and neither you nor your firm will be identified in any way.

Once the study is completed, you will receive, if you so desire, the executive report comparing your multinational organization against the aggregate results. The report will also include IT infrastructure investment recommendations and insights on factors influencing the characteristics of the IT infrastructure.

Thank you for your assistance. Please do not hesitate to call us at (412) 648-1716 in case you have any questions or concerns. We look forward to your participation in this study.

Sincerely,

William R. King   Paulo R. Flor
University Professor &   Project Director
Project Director

Cover Letter to Non-IS Executive (no response from Non-IS Executive only)

<<Date>>

«NonIS_Salutation» «NonIS_FirstName» «NonIS_LastName»
«NonIS_JobTitle»
«Company»
«Address1»
«Address2»
«Address3»
«City», «State» «PostalCode»

Dear «NonIS_Salutation» «NonIS_LastName»,

We have recently written to you seeking your participation in a study aiming at the understanding of what drives the characteristics of the IT infrastructure in multinational organizations like yours. The study is being conducted by the Katz Graduate School of Business and its International Business Center.

We have received your firm's response to *Questionnaire B: The Information Technology Assessment,* which we asked you to forward to the executive administratively responsible for global IT resources (the response was received from «IS_Salutation» «IS_FirstName» «IS_LastName»). However, we have not yet received a response to *Questionnaire A: The Organizational Assessment.* This response is indispensable for an appropriate analysis of the issues of interest. Without a complete set of responses, we are unable to include your multinational organization in our final analysis. We therefore request your help in either answering Questionnaire A or forwarding it to the person you believe is best qualified to answer it.

We sincerely believe that our study will provide you with useful and relevant insights on how to formulate IT investment decisions that effectively respond to the strategic requirements of your multinational organization. Executives who have already returned their responses have found the contents to be of great value in stimulating their thinking on global integration and the role of the IT infrastructure. *Furthermore, they are very interested in the customized report of the results, comparing the participating multinational organization to the final sample.*

We are enclosing a new copy of Questionnaire A for your convenience. The questionnaire should take approximately 15-20 minutes to complete. It has a control number to enable us to "match up" respondents and follow up on questionnaires that are not returned. However, we assure you that all responses will be kept strictly confidential and neither you nor your firm will be identified in any way.

Once the study is completed, you will receive, if you so desire, the executive report comparing your multinational organization against the aggregate results. The report will also include IT infrastructure investment recommendations and insights on factors influencing the characteristics of the IT infrastructure.

Thank you for your assistance. Please do not hesitate to call us at (412) 648-1716 in case you have any questions or concerns. We look forward to your participation in this study.

Sincerely,

William R. King   Paulo R. Flor
University Professor &   Project Director
Project Director

Cover Letter to Non-Referred IS Executive (no response from IS executive only)

Forwarding Note: _____

TO: _____

_____

_____

_____

<<Date>>

Dear Sir or Madam,

We hope you have received our earlier letter, sent about a month ago through «NonIS_Salutation» «NonIS_FirstName» «NonIS_LastName», seeking your participation in a study aiming at the understanding of what drives the characteristics of the IT infrastructure in multinational organizations like yours. The study is being conducted by the Joseph M. Katz Graduate School of Business and its International Business Center.

We have received «NonIS_Salutation» «NonIS_LastName»'s response to *Questionnaire A: The Organizational Assessment*. However, we also need a response to *Questionnaire B: The Information Technology Assessment* for an appropriate analysis of the issues of interest. Without a complete set of responses, we will be unable to include your multinational organization in our final analysis. We therefore requested «NonIS_Salutation» «NonIS_LastName»'s help in forwarding this questionnaire to you.

We sincerely believe that our study will provide you with useful and relevant insights on how to formulate IT investment decisions that effectively respond to the strategic needs of your multinational organization. Executives who have already returned their responses have found the contents to be of great value in stimulating their thinking on global integration and on the role of the IT infrastructure. Furthermore, they are very interested in the customized report of the results we will be providing, comparing the participating multinational organization to the final sample.

The questionnaire should take approximately 20 minutes to complete. It has a control number to enable us to "match up" respondents and follow up on questionnaires that are not returned. However, we assure you that all responses will be kept strictly confidential and neither you nor your firm will be identified in any way.

Once the study is completed, you will receive, if you so desire, the executive report comparing your multinational organization against the aggregate results. The report will also include IT infrastructure investment recommendations and insights on factors influencing the characteristics of the IT infrastructure.

Thank you for your assistance. Please do not hesitate to call us at (412) 648-1716 in case you have any questions or concerns. We look forward to your participation in this study.

Sincerely,

William R. King   Paulo R. Flor
University Professor &   Project Director
Project Director

Cover Letter to IS Executive (no response from a referred IS executive)

<<Date>>

«IS_Salutation» «IS_FirstName» «IS_LastName»
«IS_JobTitle»
«Company»
«Address1»
«Address2»
«Address3»
«City», «State» «PostalCode»

Dear «IS_Salutation» «IS_LastName»,

We hope you have received our earlier letter, sent about a month ago through «NonIS_Salutation» «NonIS_FirstName» «NonIS_LastName», seeking your participation in a study aiming at the understanding of what drives the characteristics of the IT infrastructure in multinational organizations like yours. The study is being conducted by the Joseph M. Katz Graduate School of Business and its International Business Center.

We have received «NonIS_Salutation» «NonIS_LastName»'s response to *Questionnaire A: The Organizational Assessment*. However, we also need a response to *Questionnaire B: The Information Technology Assessment* for an appropriate analysis of the issues of interest. Without a complete set of responses, we will be unable to include your multinational organization in our final analysis. Since your name was provided to us by «NonIS_Salutation» «NonIS_LastName»'s office as the person to whom Questionnaire B was initially forwarded, we would like to request your help in answering it.

We sincerely believe that our study will provide you with useful and relevant insights on how to formulate IT investment decisions that effectively respond to the strategic requirements of your multinational organization. Executives who have already returned their responses have found the contents to be of great value in stimulating their thinking on global integration and the role of the IT infrastructure. Furthermore, they are very interested in the customized report of the results we will be providing, comparing the participating multinational organization to the final sample.

We are enclosing a new copy of Questionnaire B for your convenience. The questionnaire should take approximately 20 minutes to complete. It has a control number to enable us to "match up" respondents and follow up on questionnaires that are not returned. However, we assure you that all responses will be kept strictly confidential and neither you nor your firm will be identified in any way.

Once the study is completed, you will receive, if you so desire, the executive report comparing your multinational organization against the aggregate results. The report will also include IT infrastructure investment recommendations and insights on factors influencing the characteristics of the IT infrastructure.

Thank you for your assistance. Please do not hesitate to call us at (412) 648-1716 in case you have any questions or concerns. We look forward to your participation in this study.

Sincerely,

William R. King   Paulo R. Flor
University Professor &   Project Director
Project Director

Appendix E – Cover Letters for 3rd Mailing

Cover Letter to Non-IS Executive (no response from both exectuvies)

<<Date>>

«NonIS_Salutation» «NonIS_FirstName» «NonIS_LastName»
«NonIS_JobTitle»
«Company»
«Address1»
«Address2»
«City», «State» «PostalCode»

Dear «NonIS_Salutation» «NonIS_LastName»,

We have recently written to you seeking your participation in the study *Global Integration: Evaluating Requirements & Building Capabilities*, aimed at the understanding of how firms like yours build the organizational and information technology (IT) infrastructures necessary to maintain global operations.

We are currently concluding the data collection phase of our study and we expect to have the results available within the next two months. Since we have received a very positive response to the study, *which will provide to all participating firms a customized report of the results,* we would like to take this opportunity to remind you of our study and make a request for your participation.

We sincerely believe that our results will provide you with useful and relevant insights on how to develop organizational capabilities and make IT investment decisions that effectively respond to the strategic needs of your multinational organization. Executives who have already returned their responses have in several occasions expressed to us the great value of the contents in stimulating their thinking on global integration and the related infrastructure issues. In addition, they are very interested in the final report, which will compare their firm to aggregate responses.

We are enclosing new copies of the two questionnaires intended to assess the organizational and IT infrastructure issues of interest. We would like for you to:

- Answer *Questionnaire A: The Organizational Assessment* **or** forward it to the executive in your firm directly responsible for the management of international operations.

- Forward *Questionnaire B: The Information Technology Assessment* and the accompanying cover letter to the executive in your firm administratively responsible for global IT resources.

Each questionnaire should take approximately 20 minutes to complete. The questionnaires have a control number to enable us to "match up" respondents and follow up on questionnaires that are not returned. However, we assure you that all responses will be kept strictly confidential.

Once the study is completed, you will receive, if you so desire, the executive report comparing your multinational organization to the aggregate results. The report will also include infrastructure investment recommendations and insights on factors influencing the characteristics of the global infrastructure.

Thank you for your assistance. Please do not hesitate to call us at (412) 648-1716 in case you have any questions or concerns. We look forward to your participation in our study!

Sincerely,

William R. King   Paulo R. Flor
University Professor &   Project Director
Project Director

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Cover Letter to IS Executive (no response from both executives)

TO: _____

_____

_____

_____

Forwarding Note: _____

<Date>

Dear Sir or Madam,

We hope you have received our earlier letters, sent recently through your colleague, seeking your participation in the study *Global Integration: Evaluating Requirements & Building Capabilities.* This study is aimed at the understanding of how firms like yours build the organizational and information technology (IT) infrastructures necessary to maintain operations in a globally integrated environment.

We are currently concluding the data collection phase of our study and we expect to have the results available within the next two months. Since we have received a very positive response to the study, *which will provide to all participating firms a customized report of the results,* we would like to take this opportunity to remind you of our study and make a final request for your participation.

We sincerely believe that our results will provide you with useful and relevant insights on how to develop organizational capabilities and make IT investment decisions that effectively respond to the strategic needs of your multinational organization. Executives who have already returned their responses have in several occasions expressed to us the great value of the contents in stimulating their thinking on global integration and the related IT infrastructure issues. In addition, they are very interested in the final report, which will compare their firm to the aggregate responses.

We are enclosing a new copy of the questionnaire intended to assess the characteristics of the IT infrastructure in your multinational organization. The executive in your firm responsible for the management of global operations is answering *Questionnaire A: The Organizational Assessment.* The two will provide us with all data necessary for analysis.

This questionnaire should take approximately 15-20 minutes to complete. It has a control number to enable us to "match up" respondents and follow up on questionnaires that are not returned. However, we assure you that all responses will be kept strictly confidential.

Once the study is completed, you will receive, if you so desire, the executive report comparing your multinational organization against the aggregate results. The report will also include IT infrastructure investment recommendations and insights on factors influencing the characteristics of the IT infrastructure.

Thank you for your assistance. Please do not hesitate to call us at (412) 648-1716 in case you have any questions or concerns. We look forward to your participation in this study.

Sincerely,

William R. King
University Professor &
Project Director

Paulo R. Flor
Project Director

Appendix F – Card for Referral of IS Executive

Attn: Paulo R. Flor

‖‖‖‖

BUSINESS   REPLY   MAIL

POSTAGE WILL BE PAID BY ADDRESSEE

JOSEPH M. KATZ GRADUATE SCHOOL OF BUSINESS
UNIVERSITY OF PITTSBURGH
4200 5TH AVENUE
PITTSBURGH, PA 15213-9972

Global Integration:
Evaluating Requirements
& Building Capabilities

To ensure that a complete set of questionnaires is received from your organization, please provide us with the following information about the executive to whom you forwarded *Questionnaire B: The Information Technology Assessment.* Thank you!

Name: _____

Job Title: _____

Address: _____

_____

_____

Phone #:   _____

If you have any questions or concerns, please call us at (412) 648-1716.

Control #: _____

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Appendix G – Instructions for Pre-Testing of Instruments

<Date>

Dear _____:

I have been designing the following survey questionnaires as part of my dissertation project, and I wondered if you help me pre-test the two instruments, which I have enclosed. Please use the following instructions when pre-testing the questionnaires:

- The questionnaires were designed to assess the several constructs of my research model. Please refer to the attached abstract, research model, definitions, propositions and hypotheses for details of this research project.
- The population of interest for the *Questionnaire A – The Organizational Assessment* is top executives of US multinational organizations. I will most probably send it to the COO – Chief Operating Officer or the executive responsible for International Operations.
- The population of interest for the *Questionnaire B – The Information Technology Assessment* is top IS executives of US multinational organizations. I will most probably send it to the CIO – Chief Information Officer.
- In this pre-testing task I would like for you to review both questionnaires. Try to take the perspective of these executives when reviewing the questions. In particular, I would like for you to assess the questionnaires by answering the following questions:
  1. Is each of the items measuring what it is intended to measure? (NOTE: The definitions being provided to you are followed by the items measuring that particular dimension).
  2. Are all the words and sentences understood?
  3. Does each close-ended question have an answer that applies to each respondent?
  4. Are questions provided with correct options for answer?
  5. Does any aspect of the questionnaires suggest bias on the part of the researcher? (NOTE: I purposely did not shuffle the items within a section to facilitate the pre-testing phase. I will shuffle them once the pre-test phase is over).
  6. Do the questionnaires create a positive impression, one that motivates top executives to answer it?
- For the purposes of this pre-test, I also would like to ask you to keep track of the time you spent reading and reviewing each of the questionnaires in their entirety. Write down the time spent in the spaces below:
  Questionnaire A – The Organizational Assessment: _____
  Questionnaire B – The Information Technology Assessment: _____
- You may use the margins and the back cover of the questionnaires to write any comments or suggestions that you might have.
- I would like to have your review by <Date>, if possible. Please return the questionnaires plus this letter with the timing information.
- If you have any questions, give me a call (office: 648-1716, home: 361-5390) or send me an e-mail (flor+@pitt.edu).

Thank you for your help, time and consideration!

Paulo

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Appendix H – Questionnaire A: The Organizational Assessment

Global Integration:
Evaluating Requirements
& Building Capabilities
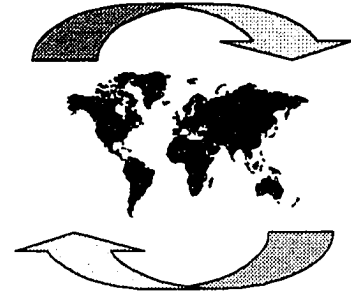
Questionnaire A

The Organizational Assessment

This study is being conducted by the

and is sponsored by the

Joseph M. Katz
Graduate School of Business

International Business Center
University of Pittsburgh

This study aims at understanding the development of global integration in multinational organizations. What drives global integration? What are the requirements faced by firms pursuing globally integrated operations? How do you build the necessary organizational and information technology (IT) infrastructures to support such operations?

This questionnaire requires approximately 20 minutes to complete. It assesses several aspects of your organization. Together with *Questionnaire B: The Information Technology Assessment*, it will provide all information necessary for a complete analysis of the issues.

Please answer all questions. If you wish to comment on any question or qualify your answers, please use the margins or the back cover.

Return this questionnaire to:

Joseph M. Katz Graduate School of Business
University of Pittsburgh
Pittsburgh, PA 15260

Attn: William R. King / Paulo R. Flor

Contact Information:

Tel: (412) 648-1587 or (412) 648-1716
Fax: (412) 648-1693
E-mail: flor+@pitt.edu

Pledge of Confidentiality:

We assure that individual responses will remain confidential and that all information gathered will be aggregated and used for research purposes only.

Thank you for your time and attention!

Control #: _____

(for matching purposes)

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DEFINITIONS

Some definitions that might clarify the concepts we are trying to assess include:

NATIONAL UNITS: The subsidiaries and offices partially or wholly owned by your multinational organization in various nations. Unless an item specifically refers to the corporate headquarters, you should also consider the corporate headquarters to be a national unit.

PHYSICAL ASSETS: Work and production related objects such as raw materials, work-in-progress, components and parts, finished products, prototypes, supplies, promotion material, etc.

INFORMATION: Forms, memos, reports, messages, drawings, orders, minutes of meetings, files, and data sets both in paper and/or electronic format. Computer and paper-based files with organizational data are information; not physical assets.

HUMAN RESOURCES: The people employed by all national units of your multinational organization.

FINANCIAL RESOURCES: Any form of capital and monetary funds available for the national units of your multinational organization.

YOUR PRIMARY INDUSTRY

Q1 What is the primary industry in which your multinational organization competes (please check the appropriate box)?

☐ Food and kindred products   ☐ Tobacco products

☐ Textile mill products   ☐ Apparel and other textile products

☐ Lumber and wood products   ☐ Furniture and fixtures

☐ Paper and allied products   ☐ Printing and publishing

☐ Chemicals and allied products   ☐ Petroleum and coal products

☐ Rubber and miscellaneous plastic products   ☐ Leather and leather products

☐ Stone, clay and glass products   ☐ Primary metal industries

☐ Fabricated metal products   ☐ Industrial machinery and equipment

☐ Electronic and other electric equipment   ☐ Transportation equipment

☐ Instruments and related products   ☐ Other: _____

Q2 SIC code of the primary industry (if known): _____

1

SECTION 1: GLOBALIZATION POTENTIAL OF YOUR PRIMARY INDUSTRY

Please indicate the extent to which you agree with the following statements describing **the primary industry** in which your organization operates (circle the appropriate number):

		Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
1.	Selling products globally reduces unit production cost	1	2	3	4	5	6	7
2.	The rate of product innovation requires high R&D budgets	1	2	3	4	5	6	7
3.	Production process technologies are frequently updated .	1	2	3	4	5	6	7
4.	Operating at an efficient scale requires foreign expansion	1	2	3	4	5	6	7
5.	Wages vary significantly across countries	1	2	3	4	5	6	7
6.	Customers have common purchasing habits worldwide ..	1	2	3	4	5	6	7
7.	The availability of relevant skills varies across countries .	1	2	3	4	5	6	7
8.	Interest rates differ substantially across countries	1	2	3	4	5	6	7
9.	Needs for products and services are similar worldwide ...	1	2	3	4	5	6	7
10.	International operations are economically attractive	1	2	3	4	5	6	7
11.	Products must be constantly enhanced and improved	1	2	3	4	5	6	7
12.	Similar expectations about products exist worldwide	1	2	3	4	5	6	7

SECTION 2: THE STRATEGIC ORIENTATION OF YOUR MULTINATIONAL ORGANIZATION

Please indicate the extent to which you agree with the following statements describing **the strategic orientation** of your multinational organization (circle the appropriate number):

		Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
1.	The stand-alone contribution to revenues and profits of a market is the primary criterion for investment decisions	1	2	3	4	5	6	7
2.	Your multinational organization seeks standardization of products across national units as much as possible	1	2	3	4	5	6	7
3.	National units are assigned different strategic roles based on their unique strengths and competencies	1	2	3	4	5	6	7
4.	Investments in national markets are primarily based on their contribution to the organization's global positioning ..	1	2	3	4	5	6	7
5.	The national units pursue independent strategies	1	2	3	4	5	6	7
6.	Response to fluctuations in exchange rates usually involves actions in multiple national units	1	2	3	4	5	6	7
7.	Competitive actions taken by your organization usually involve the participation of multiple national units	1	2	3	4	5	6	7
8.	The national units' strengths are leveraged globally	1	2	3	4	5	6	7
9.	National units operating in markets offering unique advantages are assigned distinctive strategic roles	1	2	3	4	5	6	7
10.	National markets are chosen based on their potential to enhance the global competitiveness of your organization ..	1	2	3	4	5	6	7
11.	Response to changes in government policies usually involves actions in multiple national units	1	2	3	4	5	6	7
12.	Your multinational organization seeks customization of products across national markets as much as possible	1	2	3	4	5	6	7
13.	The response to a competitive attack in one national market involves the concerted action of multiple units	1	2	3	4	5	6	7
14.	Operational flexibility is achieved by the concurrent adaptation of multiple national units to uncertain events ...	1	2	3	4	5	6	7
15.	National units use similar marketing approaches	1	2	3	4	5	6	7

2

SECTION 3: THE LEVEL OF INTERDEPENDENCE AMONG NATIONAL UNITS

Q1 To what <u>extent</u> are the following resources exchanged among national units?

	Not at all	Some extent	Moderate extent	Great extent	Extreme extent
Physical......	1	2	3	4	5
Information.	1	2	3	4	5
Human.......	1	2	3	4	5
Financial.....	1	2	3	4	5

Q3 How <u>dependent</u> are national units on one another for the following resources?

	Not at all	To some extent	Moderately	To a great extent	Extremely
Physical......	1	2	3	4	5
Information.	1	2	3	4	5
Human.......	1	2	3	4	5
Financial.....	1	2	3	4	5

Q2 How <u>important</u> is the exchange of the following resources among national units?

	Not at all	To some extent	Moderately	To a great extent	Extremely
Physical......	1	2	3	4	5
Information.	1	2	3	4	5
Human.......	1	2	3	4	5
Financial.....	1	2	3	4	5

Q4 How <u>difficult</u> would it be for national units <u>to expand operations</u> without significant transfer of these resources from other national units?

	Not at all	To some extent	Moderately	To a great extent	Extremely
Physical......	1	2	3	4	5
Information.	1	2	3	4	5
Human.......	1	2	3	4	5
Financial.....	1	2	3	4	5

Q5 How <u>frequently</u> do the national units exchange the following resources (please *approximate*)?

	Every six months or longer	Once a quarter	Once a month	Every two weeks	Once a week	Every three days	Once a day or less
Physical assets	1	2	3	4	5	6	7
Information	1	2	3	4	5	6	7
Human resources	1	2	3	4	5	6	7
Financial resources	1	2	3	4	5	6	7

Q6 How <u>delayed</u> can the exchange of following resources among the national units be before the operations of your organization are negatively affected (please *approximate*)?

	Six months or longer	About one quarter	About one month	About two weeks	About one week	About three days	About one day or less
Physical assets	1	2	3	4	5	6	7
Information	1	2	3	4	5	6	7
Human resources	1	2	3	4	5	6	7
Financial resources	1	2	3	4	5	6	7

Q7 Please indicate the extent to which the <u>exchange</u> of the following resources occurs <u>between these units</u> (circle the appropriate number):

BETWEEN HEADQUARTERS AND NATIONAL UNITS

	Not at all	Some extent	Moderate extent	Great extent	Extreme extent
Physical......	1	2	3	4	5
Information.	1	2	3	4	5
Human.......	1	2	3	4	5
Financial.....	1	2	3	4	5

AMONG NATIONAL UNITS (EXCLUDING HEADQUARTERS)

	Not at all	Some extent	Moderate extent	Great extent	Extreme extent
Physical......	1	2	3	4	5
Information.	1	2	3	4	5
Human.......	1	2	3	4	5
Financial.....	1	2	3	4	5

3

Q8 **Please indicate the extent to which the following <u>functional activities</u> are <u>concentrated or distributed</u> among national units of your multinational organization (circle the appropriate number):**

		One location	Many locations	All locations	Not applicable
1.	Raw materials and parts procurement	1	2	3	na
2.	Manufacturing operations	1	2	3	na
3.	Product distribution	1	2	3	na
4.	Sales activities	1	2	3	na
5.	Product promotion and advertising	1	2	3	na
6.	Customer service	1	2	3	na
7.	Raising and managing capital	1	2	3	na
8.	Cash flow management	1	2	3	na
9.	Accounting/legal activities	1	2	3	na
10.	Information systems/data processing	1	2	3	na
11.	Government relations/public relations	1	2	3	na
12.	Human resources management	1	2	3	na
13.	Product research and development	1	2	3	na
14.	Production process research and development	1	2	3	na

SECTION 4: THE LEVEL OF AGREEMENT AMONG NATIONAL UNITS

Please indicate the extent to which you agree with the following statements describing <u>the level of agreement among national units</u> of your multinational organization (circle the appropriate number):

		Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
1.	National units tend to disregard the multinational organization's strategic decisions	1	2	3	4	5	6	7
2.	Conflict of interests exist among national units	1	2	3	4	5	6	7
3.	National units disagree over the ways operations are managed by your multinational organization	1	2	3	4	5	6	7
4.	National units agree over the human resources practices of the multinational organization	1	2	3	4	5	6	7
5.	Actions taken by national units are fully consonant with executing the strategic decisions set forth by the multinational organization	1	2	3	4	5	6	7
6.	Goals of the national units are congruent with the goals of the multinational organization	1	2	3	4	5	6	7
7.	National units agree over the scheduling of activities across the multinational organization	1	2	3	4	5	6	7
8.	National units follow recommendations and strategic decisions made by the multinational organization	1	2	3	4	5	6	7
9.	National units agree over the goals and objectives of the multinational organization	1	2	3	4	5	6	7
10.	National units fully accept and implement the strategic decisions made by the multinational organization	1	2	3	4	5	6	7
11.	National units disagree over the allocation of resources across the multinational organization	1	2	3	4	5	6	7
12.	Goals and objectives for the market where national units operate are in conflict with those of the multinational organization	1	2	3	4	5	6	7

4

SECTION 6: THE ADMINISTRATIVE MECHANISMS OF YOUR MULTINATIONAL ORGANIZATION

Please indicate the extent to which you agree with the following statements describing <u>the ways in which the operations are managed</u> in your multinational organization (circle the appropriate number):

		Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
1.	If the national units' performance goals are not met, they are required to explain why	1	2	3	4	5	6	7
2.	Formal meetings are regularly scheduled for discussion of problems common to multiple national units	1	2	3	4	5	6	7
3.	A fairly well defined set of rules and policies is available for the activities of the national units	1	2	3	4	5	6	7
4.	Specific performance goals are established for the activities of the national units	1	2	3	4	5	6	7
5.	Inter-unit teams and committees coordinate activities common to multiple national units	1	2	3	4	5	6	7
6.	Decisions regarding the strategies and operations of national units are made at the corporate headquarters	1	2	3	4	5	6	7
7.	The corporate headquarters evaluates the procedures used by the national units to accomplish a given task	1	2	3	4	5	6	7
8.	National units are provided with procedures that define the course of action to be taken under different situations	1	2	3	4	5	6	7
9.	The corporate headquarters monitors the extent to which the national units follow established procedures	1	2	3	4	5	6	7
10.	The corporate headquarters modifies the national units' procedures when desired results are not obtained	1	2	3	4	5	6	7
11.	In general, national units enjoy autonomy for deciding their strategies and operating policies	1	2	3	4	5	6	7
12.	Reward systems are similar across national units	1	2	3	4	5	6	7
13.	Corporate meetings and gatherings aimed at increasing contact among national units' managers are sponsored by your multinational organization	1	2	3	4	5	6	7
14.	National units maintain discretion over their operations and the scheduling of their activities	1	2	3	4	5	6	7
15.	Your multinational organization makes use of task forces to facilitate collaboration among the national units	1	2	3	4	5	6	7
16.	In general, managers across national units maintain personal informal contacts with each other	1	2	3	4	5	6	7
17.	Informal meetings are held to facilitate the interaction among managers of the national units	1	2	3	4	5	6	7
18.	Your multinational organization maintains worldwide training programs for managers of the national units	1	2	3	4	5	6	7
19.	Policies and rules governing the activities of the national units are formalized through instruments such as manuals, standard operating procedures, etc.	1	2	3	4	5	6	7
20.	The corporate headquarters monitors the extent to which the national units' attain their performance goals	1	2	3	4	5	6	7
21.	Managers across national units are provided with well-defined and common career paths	1	2	3	4	5	6	7

5

BACKGROUND INFORMATION

Q1 For the last fiscal year, please <u>approximate</u> the following for your multinational organization:

Number of national units (include the corporate headquarters): _____

Number of full-time employees: _____

Total sales (in U.S. $): _____

Non-US sales as percent of total sales (%): _____

Non-US profit as percent of total profits (%): _____

Q2 How long has your multinational organization maintained foreign operations? _____ years.

Q3 What is your current position/job title? _____

THANK YOU!

Thank you for your time and effort in answering this questionnaire. If you are interested in receiving the Executive Summary of the results including comparison information about your multinational organization relative to the final sample, please fill in your name and address (or attach a business card) so that we may send you the final report.

Name: _____

Company: _____

Address: _____

_____

_____

Phone/Fax: _____

COMMENTS, SUGGESTIONS AND INSIGHTS

Global Integration: Evaluating Requirements & Building Capabilities
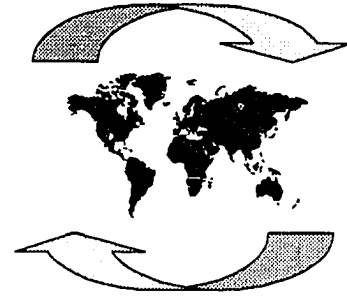
Questionnaire **B**

The Information Technology Assessment

This study is being conducted by the

and is sponsored by the

Joseph M. Katz
Graduate School of Business

International Business Center
University of Pittsburgh

This study aims at understanding the development of global integration in multinational organizations. What drives global integration? What are the requirements faced by firms pursuing globally integrated operations? How do you build the necessary organizational and information technology (IT) infrastructures to support such operations?

This questionnaire requires approximately 20 minutes to complete. It assesses several aspects of the IT infrastructure in your organization. Together with *Questionnaire A: The Organizational Assessment*, it will provide all information necessary for a complete analysis of the issues.

Please answer all questions. If you wish to comment on any question or qualify your answers, please use the margins or the back cover.

Return this questionnaire to:

Joseph M. Katz Graduate School of Business
University of Pittsburgh
Pittsburgh, PA 15260

Attn: William R. King / Paulo R. Flor

Contact Information:

Tel: (412) 648-1587 or (412) 648-1716
Fax: (412) 648-1693
E-mail: flor+@pitt.edu

Pledge of Confidentiality:

We assure that individual responses will remain confidential and that all information gathered will be aggregated and used for research purposes only.

Thank you for your time and attention!

Control #:_____

(for matching purposes)

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DEFINITIONS

Some definitions that might clarify the concepts we are trying to assess include:

NATIONAL UNITS: The subsidiaries and offices partially or wholly owned by your multinational organization in various nations. <u>Unless an item specifically refers to the corporate headquarters, you should also consider the corporate headquarters to be a national unit</u>.

INFORMATION TECHNOLOGY (IT) INFRASTRUCTURE: The set of IT resources providing computer-based support to the firm's operations. It includes technical elements such as hardware, operating systems, networks, and databases as well as human activities such as planning and services.

COMPUTER PLATFORMS: The combination of all <u>hardware and operating system software</u> on which information systems and data are used and stored. It includes both mainframe and smaller, networked systems.

SHARED DATABASES: Single databases that are <u>shared and accessed by multiple national units</u> of your multinational organization. Master files or databases of customers, parts, or products accessed by multiple national units are examples of shared databases.

STANDARD RECORD STRUCTURES: Rules that control how individual data elements are assembled into records. A record level standard for a PARTS record may specify a STATUS field of 1 column followed by a PARTS_ID field of 8 columns followed by a DESCRIPTION field of 30 columns. Standard record structures are different from shared databases in that the same standard structure can apply to the data stored on databases located in multiple national units yet the data itself may not be shared.

STANDARD FIELD DEFINITIONS: Rules that define the meaning of individual data elements. For example, STATUS may have a standard definition meaning whether a particular part is scheduled for production in the next 60 days. Standard field definitions are often stored in a data dictionary or repository and may be used as guidelines for the development of databases by the national units of your multinational organization.

1

SECTION 1: THE OBJECTIVES OF THE GLOBAL IT INFRASTRUCTURE

Please indicate the extent to which you agree with the following statements describing the objectives to be accomplished by the IT infrastructure in your multinational organization:

		Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
1.	To allow the exchange of data on activities spanning multiple national units	1	2	3	4	5	6	7
2.	To help national units make explicit the reasons for their decisions to other units of the multinational organization ...	1	2	3	4	5	6	7
3.	To plan and schedule activities spanning multiple national units	1	2	3	4	5	6	7
4.	To allow communication between the national units and units they must report to (e.g., corporate headquarters)	1	2	3	4	5	6	7
5.	To allow communication among national units	1	2	3	4	5	6	7
6.	To help national units analyze their shared problems	1	2	3	4	5	6	7
7.	To control or shape the decision-making process regarding issues common to the national units	1	2	3	4	5	6	7
8.	To help national units explain decisions to other units	1	2	3	4	5	6	7
9.	To help national units make sense out of data generated across your multinational organization	1	2	3	4	5	6	7
10.	To allow the coordination of activities among units	1	2	3	4	5	6	7
11.	To help national units decide how to best approach a common problem	1	2	3	4	5	6	7
12.	To keep the corporate or regional headquarters informed about the performance of national units	1	2	3	4	5	6	7
13.	To monitor the performance of national units	1	2	3	4	5	6	7

SECTION 2: THE REACH OF THE GLOBAL IT INFRASTRUCTURE

The number of national units provided with shared IT resources defines the reach of your IT infrastructure. Please indicate the reach of the following information technologies across your multinational organization (circle the appropriate number):

		Within national unit	Across many units	Across all units	Resource not available
1.	Applications accessing data from multiple databases	1	2	3	na
2.	Electronic meetings using videoconferencing technologies	1	2	3	na
3.	Applications to perform simple transactions	1	2	3	na
4.	Databases with standard record structures	1	2	3	na
5.	Electronic data interchange (EDI) and related technologies	1	2	3	na
6.	Databases with standard field definitions	1	2	3	na
7.	Electronic messaging	1	2	3	na
8.	Mechanisms for data mapping and/or translation	1	2	3	na
9.	Shared databases	1	2	3	na
10.	Standard and/or compatible hardware	1	2	3	na
11.	Standard operating systems	1	2	3	na
12.	Mechanisms to bridge different computer platforms.........................	1	2	3	na
13.	Applications integrating business processes	1	2	3	na

2

SECTION 3: THE FUNCTIONALITY OF THE GLOBAL IT INFRASTRUCTURE

Please indicate the extent to which you agree with the following statements describing the level of functionality offered by the IT infrastructure in your multinational organization (circle the appropriate number):

	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
1. Communications across national units rely primarily on electronic messaging systems	1	2	3	4	5	6	7
2. National units have similar hardware and operating systems configurations	1	2	3	4	5	6	7
3. Applications developed at a national unit may be transferred to computer platforms of other units without major modifications	1	2	3	4	5	6	7
4. Data entry to databases at multiple locations can be made through applications shared by the national units	1	2	3	4	5	6	7
5. National units are provided with applications that allow them to coordinate shared activities	1	2	3	4	5	6	7
6. The network/telecommunication infrastructure allows multiple national units to transmit various types of data (text, graphics and audio) electronically	1	2	3	4	5	6	7
7. National units maintain local databases with identical, replicated data elements and standard record structures	1	2	3	4	5	6	7
8. Applications used by your multinational organization cover business processes crossing national units	1	2	3	4	5	6	7
9. The exchange of operational data across national units relies primarily on the use of electronic data interchange and related technologies	1	2	3	4	5	6	7
10. Integration of business processes spanning multiple national units is entirely hard coded into applications	1	2	3	4	5	6	7
11. Computer platforms used for critical shared tasks across national units are compatible	1	2	3	4	5	6	7
12. Data mapping or translation must occur when data elements are transferred across national units	1	2	3	4	5	6	7
13. The network/telecommunication infrastructure is capable of carrying high bandwidth applications across units	1	2	3	4	5	6	7
14. National units access information pertinent to activities spanning multiple units through a single application	1	2	3	4	5	6	7
15. Your multinational organization utilizes shared databases for data relevant to multiple national units	1	2	3	4	5	6	7
16. National units with different computer platforms are provided with bridging mechanisms to allow processing of shared transactions	1	2	3	4	5	6	7
17. Databases maintained by the national units make use of standard record structures	1	2	3	4	5	6	7
18. Applications used for critical shared tasks can be readily migrated across computer platforms of national units	1	2	3	4	5	6	7
19. The network/telecommunication infrastructure allows multiple national units to hold electronic meetings	1	2	3	4	5	6	7
20. Databases at national units make use of data definitions standardized across the multinational organization	1	2	3	4	5	6	7

3

SECTION 4: THE SUPPORT TO THE GLOBAL IT INFRASTRUCTURE

Please indicate **the degree of responsibility taken by the corporate or regional IS groups** in providing the following IT infrastructure services to the national units of your multinational organization (check the appropriate box):

	No responsibility	Shared responsibility with nat'l unit	Major/full responsibility
1. Management of corporate communication network services	1	2	3
2. Management of organization-wide messaging services	1	2	3
3. Recommend standards for the components of the IT infrastructure	1	2	3
4. Security, disaster planning and business recovery for applications and installations....	1	2	3
5. Technology advice and support services	1	2	3
6. Management, maintenance, and support of large-scale data processing facilities	1	2	3
7. Management of organization-wide applications and databases	1	2	3
8. Management of IS projects involving multiple national units	1	2	3
9. Data management advice and consulting services	1	2	3
10. Providing IS planning for national units	1	2	3
11. Enforcement of standards for the IT infrastructure components	1	2	3
12. Management of national unit-specific networks	1	2	3
13. Managing and negotiating with organization-wide suppliers and outsourcers	1	2	3
14. Identification and testing of new technologies for use of the national units	1	2	3
15. Development of national unit-specific applications	1	2	3
16. Implementation of security, disaster planning and recovery for national units	1	2	3
17. Electronic provision of management information on national units' activities	1	2	3
18. Maintenance of national unit specific applications	1	2	3
19. Development of standard record structures and standard field definitions	1	2	3
20. Development and management of on-line and EDI linkages among national units	1	2	3
21. Development of a common systems development environment	1	2	3
22. Technology training and education services	1	2	3
23. Multimedia operations and development	1	2	3

4

Please indicate the extent to which you agree with the following statements describing the overall IT infrastructure plan in your multinational organization (circle the appropriate number):

The overall IT infrastructure plan specifies rules, policies, and guidelines concerning:

	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
1. The development of applications providing information relevant to activities shared by multiple units	1	2	3	4	5	6	7
2. Standardization of operating systems across units	1	2	3	4	5	6	7
3. The overall connectivity of mainframes/workstations/PCs across national units	1	2	3	4	5	6	7
4. The development of networks for handling electronic transmission and distribution of data across units	1	2	3	4	5	6	7
5. The development of applications incorporating business rules and policies shared by multiple national units	1	2	3	4	5	6	7
6. Standardization of record structures across units	1	2	3	4	5	6	7
7. Compatibility of hardware across national units	1	2	3	4	5	6	7
8. The development of networks for handling multimedia communication across national units	1	2	3	4	5	6	7
9. The development of centralized databases for storage of data elements shared by multiple national units	1	2	3	4	5	6	7
10. The selection and use of network and/or telecommunication protocols by the national units	1	2	3	4	5	6	7
11. The development of standard field definitions for data elements shared by multiple national units	1	2	3	4	5	6	7
12. Standardization of hardware across national units	1	2	3	4	5	6	7
13. The development of applications to integrate business processes spanning multiple national units	1	2	3	4	5	6	7
14. The development of mechanisms to translate and/or map data elements across national units	1	2	3	4	5	6	7
15. The development of applications interfacing with databases located in multiple national units	1	2	3	4	5	6	7
16. Compatibility of operating systems across national units.	1	2	3	4	5	6	7

BACKGROUND INFORMATION

Q1 For the last fiscal year, please approximate the following for your multinational organization:

Number of national units (include the corporate headquarters): _____

Number of full-time IS employees (worldwide): _____

Number of full-time IS employees (based in the U.S.): _____

Worldwide IS budget (in U.S. $): _____

Q2 How long has your multinational organization maintained foreign operations? _____ *years.*

Q3 What is your current position/job title? _____

THANK YOU!

Thank you for your time and effort in answering this questionnaire. If you are interested in receiving the Executive Summary of the results including comparison information about the IT infrastructure in your multinational organization relative to the final sample, please fill in your name and address (or attach a business card) so that we may send you the final report.

Name: _____

Company: _____

Address: _____

_____

_____

Phone/Fax: _____

COMMENTS, SUGGESTIONS AND INSIGHTS

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