

INFORMATION-PROCESSING THEORY AND THE MULTINATIONAL ENTERPRISE

William G. Egelhoff*
Fordham University

Abstract. This paper attempts to extend information-processing theory so that it can be meaningfully applied to MNCs. A specific multidimensional framework is developed that can be used to measure the information-processing capacities of macro-level features of MNC organizational design. An applied example, transnationalism, is used to illustrate how to apply the framework and demonstrate that it can contribute meaningful new insight to this complex organizational problem.

The multinational corporation (MNC) is probably the most complex form of organization in widespread existence today. Operating across products and markets, nations and cultures, it faces problems and situations far more diverse than even the largest domestic firms. With the increasing globalization of business, a rapidly growing level of economic activity now depends upon this form of organization. Thus, the MNC is an important entity for scholarly study both because its influence is growing and it presents organizational problems that lie at the forefront of organization theory and challenge the capacities of existing organization theory.

MNC research of an organizational nature has focused on two primary topics:

- What kinds of organizational design contribute to effective MNC performance and under what strategic and environmental conditions is one form of design preferable to another.
- How have MNC organizational designs changed and evolved over time and what factors cause or explain this evolution.

The principle concept associated with the first type of research has been the concept of fit (between organizational design and strategy or environment). Work has centered around how to measure fit and how to relate such fit to

*William G. Egelhoff is Associate Professor of Management Systems at Fordham University's Graduate School of Business. His current research primarily deals with strategy and strategy implementation in multinational corporations.

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performance [Stopford and Wells 1972; Franko 1976; Daniels, Pitts and Treter 1984]. Regarding how to measure fit, most MNC research has used some form of correlation technique to relate organizational design to a variety of strategic and environmental variables. Generally, little attention has been given to developing an abstract theoretical framework that could explain or support hypothesizing the relationships. A noteworthy exception is Herbert's [1984] proposed set of relationships between four types of strategy and a variety of organizational characteristics, based on resource flow considerations. While research studies frequently discuss why certain fits might contribute to effective MNC performance, fit in MNC research has tended to be expressed more in empirical than in theoretical terms. That is, the primary reason for anticipating certain fits in MNCs is that they have been found in the past, and not that any abstract theoretical framework can explain why and when they should exist. This paper will argue that information-processing theory is an attractive candidate for extending MNC research to include such a theoretical framework.

The second type of MNC research effort, how MNC organizational designs change and evolve, has largely produced a documentation, rather than a theory, of the evolution of MNC structure over time [Pavan 1972; Stopford and Wells 1972; Dyas and Thanheiser 1976]. Contingency relationships developed with cross-sectional data have not been tested longitudinally. Evolution has generally been measured only with a limited number of case studies. Existing notions about what has caused MNC structure to change and evolve over time are relatively simple and tend to lack empirical support. The basic evolution of international business form or strategy has generally been explained in economic terms [Vernon 1971; Kindleberger 1973; Stevens 1974; Hymer 1976]. As evidenced in the various stages of organizational growth models [Stopford and Wells 1972; Dyas and Thanheiser 1976], it is generally presumed that organizational structure has followed the evolution of MNC strategy and environment.

This brief overview of organizational research on the multinational enterprise has attempted to identify where the frontiers of such research might lie today. Throughout the present paper, which will develop and discuss an information-processing perspective of MNCs, we will attempt to evaluate how such a perspective might support future research on these issues.

THE CONCEPTUAL FOUNDATIONS FOR AN INFORMATION-PROCESSING PERSPECTIVE OF ORGANIZATIONS

The general idea that it would be useful to view organizations as information-processing systems seems to have several sources. Quite a few theorists have sought to understand organizations by describing them as communications systems, decisionmaking systems, or systems that have to cope with uncertainty. Although definitions of these concepts vary and for certain

purposes the distinctions may be important, they can all be subsumed under the broader notion of information processing. Information processing in organizations is generally defined as including the gathering of data, the transformation of data into information, and the communication and storage of information in the organization [Galbraith 1973; Tushman and Nadler 1978].

Theorists interested in viewing the organization from an information-processing perspective generally have focused on environmental uncertainty and how organizations absorb uncertainty as the important contingency concept. Thompson [1967:10,13] presents the conceptual argument for the importance of uncertainty:

we will conceive of complex organizations as open systems, hence, indeterminate and faced with uncertainty, but at the same time as subject to criteria of rationality and hence needing determinateness and certainty....

With this conception the central problem for complex organizations is one of coping with uncertainty. As a point of departure, we suggest that organizations cope with uncertainty by creating certain parts specifically to deal with it, specializing other parts in operating under conditions of certainty or near certainty. In this case, articulation of these specialized parts becomes significant.

We also suggest that technologies and environments are major sources of uncertainty for organizations, and that differences in those dimensions will result in differences in organizations.

Thus, Thompson suggests that uncertainty arises from certain characteristics in the environment and technology facing an organization and that differences in uncertainty somehow lead to differences in the organization's design.

Galbraith [1969, 1973, 1977] added some additional conceptualization to Thompson's general framework and developed a much more operational framework and model that has generally been referred to as an information-processing approach to organizational design. He rigorously defined the concept of uncertainty in terms of information processing: "Uncertainty is the difference between the amount of information required to perform the task and the amount of information already possessed by the organization." Thus, there is a relationship between the amount of uncertainty faced by an organization and the amount of information processing that must go on in an organization. Effective organizations are those that fit their information-processing capacities (for gathering, transforming, storing, and communicating information) to the amount of uncertainty they face.

Galbraith also specified the relative information-processing capacities of different organizational design features. These features are listed below, in order of increasing information-processing capacity [Galbraith 1973:15]:

- Rules and programs
- Hierarchical referral
- Goal-setting
- Vertical information systems
- Lateral relations

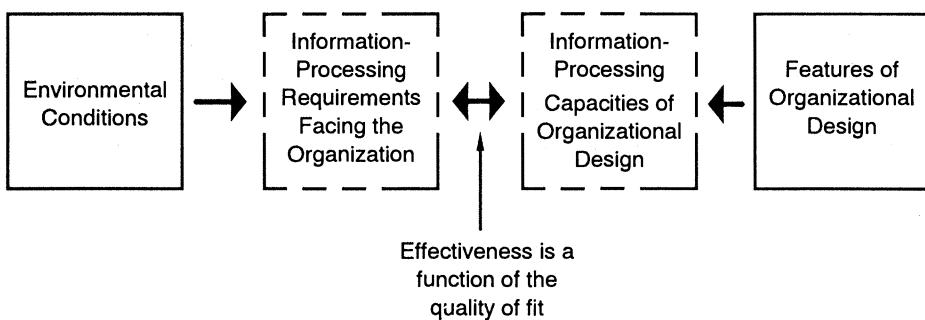
Where conditions are routine and simple, rules and programs can be used to absorb the relatively small amount of uncertainty facing the organization. For example, how foreign subsidiaries will set up their accounting systems is usually specified in a set of rules from the parent HQ describing the chart of accounts and various closing and reporting dates. Such rules absorb a good deal of uncertainty and eliminate the need for other forms of parent-subsidiary information processing. Where uncertainty increases, exceptions must be referred up the hierarchical authority structure for decisionmaking. When information-processing requirements threaten to overload the management structure, goal-setting and planning allow more decisions to be made at lower levels in the organization as long as they are within the plan. This relieves the information-processing load on the hierarchical structure.

When this is no longer adequate, various vertical information-processing systems can be attached to the hierarchical structure, which increase the organization's information-processing capacity. These frequently include computer-based information systems and staff groups and tend to increase the capacity for centralized information processing. When uncertainty and information-processing requirements are very great, the use of lateral relations allows more information processing to be decentralized so that the more limited information-processing capacity at higher levels of the organization is not overloaded. Lateral relations mechanisms include direct contact between individuals, liaison roles, task forces, teams, and matrix designs. Thus, Galbraith's model suggests a more operational framework for linking quite a number of organizational design features to the level of uncertainty or information-processing requirements facing an organization.

Uncertainty and information-processing concepts have served as the basis for a substantial number of empirical studies [Burns and Stalker 1961; Lawrence and Lorsch 1967; Galbraith 1970; Duncan 1973; Van de Ven, Delbecq and Koenig 1976; Tushman 1978; Egelhoff 1982; Kmetz 1984]. It will be helpful to summarize these views in what might be called "the general information-processing approach to organizational design." As shown in Figure 1, this general approach or model is a summary of the Galbraith [1973] and Tushman and Nadler [1978] models. It is also consistent with the conceptual approaches used in the empirical studies mentioned above.

On the one hand, the impact on an organization of its strategy and the environmental factors that it chooses to deal with can be expressed in terms of the information-processing requirements they create. On the other hand,

FIGURE 1
The General Information-Processing Approach
to Organizational Design



the potential of the organization to cope with these requirements can be expressed in terms of the information-processing capacities furnished by its organizational design.

The strategic and environmental conditions include all those factors that are external to the organization's design and that influence the information-processing requirements of the organization. These include technology, size, environmental change, environmental complexity, subunit interdependency, and goals. Similarly, the different features of an organization's design (such as structure, degree of centralization, planning and control systems, interpersonal communication patterns) must also be measured or expressed in terms of the information-processing capacity they provide.

Measuring fit between such dissimilar phenomena as (1) strategic and environmental conditions and (2) features of organizational design has troubled organization theory ever since it became contingency oriented. Aldrich [1979:45] has stated, "we know the physics of air, water, and light to which flying, swimming, and seeing creatures must conform. We need much better knowledge of organizational types and appropriate environments before we can do as well in understanding organizational change." Information-processing theory suggests that information processing may be the missing "physics" that can help us to understand better critical conformities between organizational types and environments and the impact of such conformities on organizational survival and change. The information-processing perspective calls for translating strategic and environmental conditions and organizational design features into their respective information-processing implications. Then it will be easier to measure fit between information-processing requirements and information-processing capacities, which are more comparable phenomena.

An important assumption underlying the information-processing perspective is that the quality of information-processing fit is constraining on organizational performance and survival. This assumption is more likely to be valid for large, complex organizations operating in difficult environments (competitive, heterogeneous, changing), than it is for small organizations operating in benign environments (low competition, homogeneous, stable). If information-processing fit is not constraining on performance, it makes sense to organize around some other principle that might be. For example, how to fit or satisfy the desires of local governments (a political perspective), or how to best motivate employees (a motivation perspective). Obviously it is desirable that the basis for evaluating organizational fit be stable over an extended period of time. It seems reasonable to assume that for large, complex organizations such as MNCs, the limits of information-processing capacity are frequently reached or exceeded by information-processing requirements and that the difficulty in realizing information-processing fit consistently constrains performance in such organizations.

Before proceeding, it is useful to evaluate the proposed framework against more cognitive views of organizational information processing, which have recently become prominent in the literature. Cognitive theory views organizations as systems that learn [Fiol and Lyles 1985; Ginsberg 1990] and interpret their environments [Daft and Weick 1989]. Information processing is primarily represented in terms of the cognitive abilities of organizational members (either individually or collectively) to learn, make sense out of, and make decisions for an organization, when influenced by a variety of factors such as values, beliefs, culture, and differences in power [Wood and Bandura 1989]. Environmental conditions may still be the stimulus for information processing to occur, but the emphasis is on explaining how it is influenced by what goes on within the heads of individuals (psychological determinants) and between individuals (social-psychological determinants).

By contrast, the proposed perspective, which has sometimes been referred to as a logistical view of organizational information processing [Huber 1982], views organizations as systems that need to balance the organization's information-processing capacities against the information-processing requirements inherent in its strategy and environment. Fit is equated with good organizational performance and survival, and misfit with poor performance and failure. Information processing is largely represented in terms of the capacities of different kinds of organizational structures and processes to transfer information within an organization, to move it across the boundaries of an organization, and to access specific kinds of knowledge and decisionmaking capabilities needed to transform data or information. The focus of this view is primarily on how information processing is influenced by organizational characteristics, independent of the individual characteristics of organizational members. The focus of the cognitive view is primarily on how information processing is influenced by the psychological and social-psychological characteristics of organizational members.

The two perspectives should be viewed as complementary and not contradictory explanations of organizational information processing. The cognitive perspective largely addresses how strategic decisions are made. It argues that much of the input or influence is cognitive and that strategic decisions are not merely, or even primarily, determined by organizational and environmental considerations. The unit of analysis tends to be the strategic decision or strategic issue [Dutton and Jackson 1987]. From a population ecology perspective, such strategic decisions become a source of variation and change in an organization and its position in its environment. The logistical perspective of information processing, on the other hand, does not attempt to explain the source of organizational or strategic variation or change. It tries to explain the information-processing capacities inherent in an organization's design and generally evaluates these against requirements for information processing inherent in an organization's strategy or environment.

This evaluation of fit and misfit between organizational characteristics and environmental conditions responds to the selection mechanism in a population ecology perspective and explains change not in terms of strategic decisions, but in terms of differential selection by competitive forces in firms' environments. Thus, the two perspectives have different arguments and a different purpose.

Information Processing as an Abstract Intervening Concept

With the exception of some of Galbraith's case studies [1970, 1977], the information-processing perspective has primarily been used in more micro-level studies, where the units of analysis are either individuals or small groups. Such studies have managed to measure directly such aspects of information processing as the frequency of oral communications between work groups [Tushman 1978], the extent to which policies and procedures, work plans, personal contact, and meetings are used to coordinate members of work teams [Van de Ven, Delbecq and Koenig 1976], and the structure of groups during decisionmaking [Duncan 1973]. For more macro-level studies, such as those focusing on the parent HQ-foreign subsidiary relationship in MNCs, the difficulty of directly measuring such detailed information-processing phenomena between very large subunits of an organization necessitates a different approach to operationalizing the information-processing perspective.

Instead of attempting to directly measure information processing, macro-level studies must use information processing more as an abstract intervening concept to aid in positing relationships between directly measured characteristics of an organization's design and its strategy and environment, both of which have identifiable information-processing implications. This approach is already reflected in the general information-processing approach to organizational design shown in Figure 1. The solid lines indicate that strategic and environmental conditions and organizational design features

are directly measured variables, while the broken lines indicate that information-processing requirements and information-processing capacities are abstract variables that can only be derived from measured variables.

For the information-processing approach to advance, what is needed is a more precise translation of the measured contextual and design variables into the abstract information-processing concepts that are so useful for general theory-building. This should be easier to accomplish if one first identifies the dimensions of information processing that are important to the type and level of organization being modeled and then constructs decision rules for mapping measured contextual and design variables onto these dimensions.

Multidimensional Measures of Information Processing

Most existing research that has sought to use an information-processing perspective to link organizational design to various strategic and environmental conditions does not rigorously specify the dimensions that are being used to measure and evaluate information-processing capacities and requirements. For example, consider the case of a bank that as a result of a growth strategy faces a sharp increase in the number of checks it must clear. Obviously such a strategy has led to increased requirements for information processing. Galbraith [1973] has indicated that increased information-processing requirements frequently need to be addressed by the addition of lateral information-processing systems, such as more face-to-face communications, cross-functional committees and task forces, and matrix structures, to an organization. Yet, it is doubtful that these information-processing mechanisms address the requirements associated with the increased load of check clearing. Instead, an expanded computer system, which Galbraith regards as a vertical information-processing system, seems better able to provide the kind of information-processing capacity needed to cope with the increased requirements for check-clearing.

The bank's growth strategy may also call for the development of new financial products and services. This also increases requirements for information processing within the organization, and this time the kind of information-processing capacity provided by cross-functional teams and matrix designs seems more appropriate than that provided by an expanded computer system. Both strategies lead to increased information-processing requirements for the bank, but somehow the kinds of information-processing capacity needed differ, and exactly what dimension or dimensions define this difference is not clear.

Empirical studies such as Galbraith's [1977] analysis of the information-processing requirements associated with Boeing's development of the 747, Van de Ven, Delbecq and Koenig's [1976] analysis of the differing task requirements found in an unemployment agency, or Tushman's [1978] analysis of the differing information-processing requirements facing development

groups as opposed to research groups in an R&D laboratory generally match suitable information-processing mechanisms to the different information-processing requirements and discuss a number of reasons for the suitability of the match. While such discussion often hints at how one information-processing requirement differs from another, this difference is not rigorously defined by explicitly specifying what dimension or dimensions consistently differentiate one type of information processing from another.

In other words, whether one, two, three, or four dimensions are needed to distinguish one information-processing requirement from another (or the capacity of one information-processing mechanism from another) is not clear in most studies. Information-processing requirements and capacities are not mapped onto some prespecified multidimensional framework. Instead, information-processing is used in a looser, less rigid way that only implicitly, rather than explicitly, distinguishes one type of information processing from another.

An important exception to this complaint can be found in the work of Daft and Lengel [1986] and Daft and Macintosh [1981]. These studies distinguish between equivocality reduction and uncertainty reduction in information processing and attempt to define the relative capacities of a variety of information-processing mechanisms for handling both types of information-processing requirement.

Our view is that at the macro level of large, complex organizations, other dimensions of information processing may also be useful—perhaps even more useful than uncertainty and equivocality—for measuring and evaluating information-processing requirements and capacities. At the macro level, information processing can readily vary in terms of subject and in terms of organizational purpose and perspective [Egelhoff 1982]. It can also vary in terms of being relatively routine or nonroutine within an organization and in terms of the nature of the interdependency shared by organizational subunits involved in an information-processing event. Following this view, the next section will attempt to illustrate that existing organization theory and research in a number of areas provides useful guidance for constructing explicit multidimensional frameworks for measuring information processing.

DEVELOPING AN INFORMATION-PROCESSING PERSPECTIVE OF MNCs

This section will attempt to use the information-processing concepts already discussed to develop an explicit framework for analyzing and understanding organizational design in MNCs. Deciding which dimensions to measure information processing along requires some judgment, but the general criterion should be to select dimensions that best reflect the information-processing limitations of the various features of organizational design for the strategic and environmental context in which they must operate (in this case, the complex and dynamic environment faced by most large MNCs).

Structural Dimensions

The first set of dimensions reflects the purpose and perspective of information processing (whether it is strategic or tactical) and the subject or content of information processing (whether it deals with product matters or company and country matters). Both require some explanation and conceptual development. (The following discussion about the framework shown in Figure 2 is excerpted from Egelhoff [1982].)

The *purpose and perspective of information processing* can be defined in terms of whether it is primarily strategic or primarily tactical. The conceptual distinction between these two concepts comes from the strategic management literature. Ansoff [1965] refers to operating, administrative, and strategic decisions in organizations. Tactical information processing combines the first two categories and deals with the large volume of relatively routine day-to-day problems and situations confronting an organization. The decisionmaking perspective required to handle these situations tends to be relatively narrow, and it usually exists at the middle and lower levels of management. Strategic information processing attempts to deal with a much smaller volume of relatively nonroutine, and usually more important, problems and situations. These problems deal with the fundamental position of the organization in its environment and usually involve changing this position. Thus, strategic information processing has a different purpose and requires a different perspective than tactical information processing. It addresses higher level organizational goals, is broader in scope, and usually has a longer time horizon.

Research suggests that different levels of an organization's hierarchy tend to process different kinds of information and have different purposes for processing information [Landsberger 1961; Thomason 1966]. Mintzberg [1979:54] states that "the issues each level addresses are fundamentally different," and notes that strategic decisions generally involve members of the "strategic apex" or top management of an organization. Since the majority of tactical decisions do not involve members of the strategic apex, tactical and strategic information processing tend to occur at different levels of an organization. The association of tactical and strategic perspectives with different levels of an organization presupposes that hierarchy exists in most MNCs. Recent literature suggests that MNCs may be becoming less hierarchical [Hedlund 1986; Bartlett and Ghoshal 1989]. To the extent that an MNC is less hierarchically organized, it becomes more difficult to generalize about where strategic and tactical perspectives exist in an organization.

The framework also reflects the *subject or content of information processing* and distinguishes between information processing for product matters (product and process technology, market information) and information processing for company and country matters (finance, tax, legal, government relations, human resources). Subject knowledge or specialization tends to vary horizontally

FIGURE 2
The Structural Dimensions of Information Processing

		Subject of Information Processing	
		Company & Country Matters	Product Matters
Purpose and Perspective of Information Processing	Tactical	Tactical information processing for company & country matters Example: Evaluating how and when to raise money in international money markets	Tactical information processing for product matters Example: Deciding on a routine change in the price of a product
	Strategic	Strategic information processing for company & country matters Example: Deciding on the company's position vis-a-vis foreign government pressures for local ownership in foreign subsidiaries	Strategic information processing for product matters Example: Deciding on the long-range level of R&D support for a major product line

across organizations. Different organizational structures tend to cluster it into different subunits. Using these distinctions, four types of information processing are developed, as shown in Figure 2. The four types are generally not substitutes for each other, since they tend to address different problem areas that require different types of knowledge and different perspectives of the organization and its goals.

The above set of information-processing dimensions works well to distinguish where in an organization different kinds of knowledge and different kinds of decisionmaking capability lie. It helps to identify which parts of an organization need to be linked together in order to solve a given problem or address a specific decisionmaking situation. In other words, these dimensions are useful for measuring the structural aspects of organizations and understanding their implications for information processing.

Process Dimensions

Another set of dimensions is needed, however, to measure and distinguish differences in the process by which information processing occurs, how information is gathered, processed, stored and exchanged. Such information processing occurs within and between the organizational subunits and levels that have already been identified. This second set represents the process dimensions of information processing. Here we will distinguish between routine and nonroutine information processing and sequential and reciprocal information processing.

There is a substantial literature supporting and describing the distinction between *routine and nonroutine information processing* [Simon 1977; Daft

and Macintosh 1981; Daft and Weick 1984]. Routine information processing deals with inputs that are frequent and homogeneous. It transforms them under conditions of high certainty and assumes that goals and means-ends relationships are well known. Information-processing mechanisms that most efficiently provide routine information-processing capacity are rules and programs (including organizational policies, SOPs, and standard methods), formal single-cycle planning systems (where there is no feedback from a later stage of the process to an earlier stage), post-action control systems (where feedback occurs after the controlled activity or time period is completed) [Newman 1975], and most computer-based information systems. Nonroutine information processing deals with inputs that are either unique or infrequent and heterogeneous. It transforms them under varying degrees of uncertainty about goals and/or means-ends relationships. Information-processing mechanisms that provide nonroutine information-processing capacity are hierarchical referral; some vertical information systems such as planning staffs; multi-cycle, interactive planning systems (where information developed in later stages of a planning process can feed back to earlier stages); steering control systems (where feedback occurs before an event is completed) [Newman 1975]; and most horizontal or lateral information systems (direct contact, task forces and teams, integrating roles, and matrix designs).

The distinction between *sequential and reciprocal information processing* reflects the kind of interdependency that exists between the parties to an information-processing event. This distinction is based on Thompson's [1967] typology of the three different forms of interdependence that can exist between organizational subunits (pooled, sequential, and reciprocal). Information processing is sequential to the extent that information flows in a predetermined direction across parties to an information-processing event. Information processing is reciprocal to the extent that information flows back and forth between parties in a kind of give-and-take manner that has not been previously determined.

Figure 3 shows the four types of information processing that emerge when the routine-nonroutine and sequential-reciprocal axes are combined. A specific information-processing event is also provided to illustrate each type. In order to understand better the logic employed, we will further discuss one of these events.

Consider the event where it is necessary to decide on a routine change in the price of a subsidiary's product. Since this event occurs frequently and the kinds of things that need to be considered (e.g., effect on volume and gross profit, relationship to competitors' prices) are well known, information processing is routine. And, since the information inputs of the various parties to this event (subsidiary marketing manager, subsidiary CEO, HQ marketing manager) can be combined in a sequential manner in order to arrive at an informed and responsible decision, information processing will

tend to be sequential (probably represented by a flow of memos between the concerned parties). In process terms this is simple hierarchical referral (or information processing through the chain of command), which is a commonly used routine-sequential information-processing mechanism in organizations.

But, in order to describe this event more fully, we need also to consider its structural dimensions. Recalling the previous set of information-processing dimensions described in Figure 2, it is obvious that this event deals largely with product-related knowledge as opposed to company and country-related knowledge (if host government approval for the price increase were required, the latter might also be involved). In this case the subsidiary marketing manager provides information about the increase and its relationship to competitors' prices as well as the anticipated impact on margins and sales volume. The subsidiary CEO merely checks the proposal for broad consistency with his budgeted sales and profit targets and goals concerning competitive position. The proposal is approved at a relatively low level in the HQ marketing group, where it is again checked for consistency with broad goals for the product line and more specifically checked against the price in other subsidiaries whose markets might interact with the subsidiary. Since this kind of decision is not expected to alter significantly the position of the product line in its competitive environment, the perspective that these managers tend to apply is more tactical than strategic. Thus, this event largely requires tactical information processing for product matters.

This identification or measurement has largely structural implications. It pinpoints which subunits or individuals in the organization need to be involved in the information-processing event (i.e., which can contribute the right kinds of knowledge and capabilities). The previous identification or measurement has largely process implication. It helps to identify which information-processing mechanisms (processes) are most suitable for linking together the specific subunits or individuals that possess the necessary knowledge and capabilities.

The Information-Processing Capacities of Structure

Where specific kinds of knowledge and capabilities reside in an organization is strongly influenced by its formal structure. Research on MNC structure [Brooke and Remmers 1970; Stopford and Wells 1972; Franko 1976; Hulbert and Brandt 1980; Egelhoff 1982] has helped to identify where different kinds of knowledge and capabilities tend to be located in the four elementary structures used to organize international operations. Figure 4 attempts to summarize where each of the four previously identified types of information-processing capacity tends to be located within a specific structure.

A worldwide functional division structure means that the functional activities in a foreign subsidiary report directly to their respective functional

FIGURE 3
The Process Dimensions of MNC Information Processing

		Interdependency between Parties to an Information-Processing Event	
		Sequential	Reciprocal
Routinism of an Information-Processing Event	Routine	Routine-sequential information processing Example: Deciding on a routine change in the price of a product	Routine-reciprocal information processing Example: Deciding how to handle an expatriate manager's request for reassignment back to the parent company
	Nonroutine	Nonroutine-sequential information processing Example: Exploring the possibility of selling a customer products not available in the local subsidiary, but available in another subsidiary	Nonroutine-reciprocal information processing Example: Deciding on the long-range level of R&D support for a major product line

divisions in the parent. Tactical information-processing capacity for company and country matters tends to lie in such functional divisions as finance, human resources, tax, and government affairs, both at the parent HQ and the foreign subsidiary levels. Similarly, tactical product-related information-processing capacity tends to lie in the R&D, manufacturing, and marketing divisions found at both levels. This structure should facilitate tactical information processing between the parent and foreign subsidiaries as long as the processing can take place within a functional area. Tactical information processing across functions, however, will be difficult (and require non-hierarchical processes) since the structure does not facilitate communication between divisions at either the subsidiary level or the tactical levels of the parent.

Since the formulation of business strategy requires a cross-functional perspective, strategic information processing cannot readily occur within a foreign subsidiary or even at lower levels of the parent HQ. Only at the CEO- and executive-committee level does a cross-functional or general management perspective exist, and only at this level does the structure facilitate multifunctional information coming together. While non-hierarchical information processes might be employed to bring such information together at lower levels of the organization, there is still a problem regarding the lack of a general management perspective at such levels in a functional division structure. Thus, subunits in foreign subsidiaries cannot generally participate in or make direct inputs to the strategy-formulation process. This centralization of strategic information processing means that processing capacity is limited (only a few people at one level of the parent are involved) and it is difficult for new information about the environment to enter the process.

FIGURE 4
Location of Information-Processing Capacity in the Four Elementary MNC Structures

Type of Structure	Types of Information-Processing Capacity	Tactical Information-Processing Capacity for Company & Country Matters	Tactical Information-Processing Capacity for Product Matters	Strategic Information-Processing Capacity for Product Matters
Worldwide Functional Divisions	Tactical Information-Processing Capacity for Company & Country Matters Company & country-related functional divisions of parent HQ (e.g., finance, human resources) Similar functional divisions of foreign subsidiaries	CEO & executive committee of parent HQ Higher management of international division HQ Higher management of foreign subsidiary HQs	Product-related functional divisions of parent (e.g., R&D, manufacturing, marketing) Similar functional divisions of foreign subsidiaries Domestic product divisions (outside of international structure) Product divisions of foreign subsidiaries	CEO & executive committee of parent HQ Higher management of domestic product divisions (outside of international structure) Higher management of product divisions of foreign subsidiaries
International Division	International division HQ Foreign subsidiary HQs	Higher management of foreign subsidiary HQs	Product-related management & staff of regional HQs Product divisions of domestic & foreign subsidiaries	Higher product-related management of regional HQs Higher management of product divisions of domestic & foreign subsidiaries
Geographical Regions	Company & country-related management and staff of regional HQs Domestic & foreign subsidiary HQs	Higher management of parent corporate HQ Higher management of regional HQs Higher management of domestic & foreign subsidiaries	Parent product division HQs & domestic product operations Product divisions of foreign subsidiaries	Higher management of parent product division HQs Higher management of product divisions of foreign subsidiaries
Worldwide Product Divisions	Foreign subsidiary HQs	Higher management of foreign subsidiary HQs	Parent product division HQs & domestic product operations Product divisions of foreign subsidiaries	Higher management of parent product division HQs Higher management of product divisions of foreign subsidiaries

With an international division structure, all foreign subsidiaries report to an international division that is separate from the domestic operations. Brooke and Remmers [1970] found that this structure tends to facilitate information processing between the parent and foreign subsidiaries, while at the same time it hinders information processing at the parent level between the international division and the domestic operations. Product knowledge tends to be centered in the domestic divisions, while knowledge about such company and country matters as international finance and foreign political conditions is centered in the international division. Consequently, parent-subsidiary information-processing capacity is relatively high for company and country matters and relatively low for product matters. There is a general management or strategic apex at both the subsidiary and international division levels. Thus, strategic as well as tactical information processing can take place between a subsidiary and the international division, but it will center around company and country matters rather than product matters. In order to connect foreign subsidiaries to the centers of product knowledge in the domestic product divisions, non-hierarchical information processes must be used.

A geographical region structure divides the world into regions, each with its own HQ. Each HQ is responsible for all of the company's products and business within its geographical area. The regional HQ is the center of the company's knowledge about company and country matters within the region. Most regional HQs also contain either product or functional staffs to provide coordination for product matters across subsidiaries in the region [Williams 1967]. There is a general management or strategic apex at both the subsidiary and regional HQ levels. As a result, this structure facilitates a high level of all four types of information processing between a subsidiary and its regional HQ. The information-processing capacity between a foreign subsidiary and domestic operations or a subsidiary in another region is low. The only structural mechanism for coordinating across regions is the corporate HQ, and most geographical region companies tend to have relatively small corporate managements and staffs [Egelhoff 1982]. Thus, largely non-structural or non-hierarchical information processing needs to be established if, for example, product technologies and strategies are to be coordinated between regions (the former requires largely tactical information processing, the latter, strategic information processing).

A worldwide product division structure extends the responsibilities of the domestic product divisions to cover their product lines on a worldwide basis. Under this structure, there is a tendency to centralize product-related knowledge and decisionmaking capability in the parent product groups and to decentralize nonproduct knowledge and decisionmaking to the foreign subsidiaries [Brooke and Remmers 1970]. Consequently, the capacity for processing information on company and country matters tends to be concentrated in the foreign subsidiaries, while the parent HQ tends to have a product orientation. Product-related tactical and strategic information-processing capacities, on

the other hand, tend to be highly developed at both the foreign subsidiary and parent product division levels. The product divisions in the foreign subsidiaries are directly connected through the hierarchy to the centers of product knowledge in the parent. For each product line, there is a strategic apex at both the subsidiary and parent product division levels, which facilitates strategic information processing at both levels for product matters.

As can be seen in the above discussion and Figure 4, formal structure significantly influences where specific types of knowledge and decision-making capability reside in large organizations. The four dimensions of information processing employed in Figure 4 seem a useful framework for describing these differences in MNCs. The specific locations of knowledge and decisionmaking capability are consistent with previous research findings concerning the influence of formal structure on information flows in organizations. A framework similar to that expressed in Figure 4 was previously used to develop hypotheses about strategy-structure relationships in MNCs. These were empirically tested using a sample of thirty-four elementary structure MNCs and fifteen matrix and mixed structure MNCs, representing both U.S. and European firms [Egelhoff 1988: 61-128]. The testing tended to support the framework. Thus, research to date seems (1) strongly to support the assumption that formal organizational structure has a major influence on the location of knowledge and decisionmaking capability in organizations, and (2) to provide reasonable support for the logic used in developing the specific framework shown in Figure 4. Formal structure is not the only determinant of the location of knowledge and decisionmaking capability, however, and there can be significant variance between companies with the same structure.

The Capacities of Information-Processing Mechanisms

Having created a kind of directory of where knowledge and capability tend to lie in an MNC, we need to produce an analogous directory of the kinds of information-processing mechanisms that can be used to access and connect the various sources of knowledge and capability. Figure 5 attempts to provide such a directory, by showing the different information-processing capacities of Galbraith's information-processing mechanisms plus others that are frequently used at the parent-foreign subsidiary level of analysis in MNCs.

It is important to realize that the routinism and interdependency axes are Gutman-like scales. Thus, mechanisms capable of providing nonroutine information processing can also provide routine information processing and mechanisms capable of providing reciprocal information processing can also provide sequential information processing, but usually at a lower volume and/or at a greater cost than mechanisms specifically designed to cope with more routine or sequential information-processing requirements.

FIGURE 5
The Capacities of Information-Processing Mechanisms

	Sequential Information-Processing Capacity	Reciprocal Information-Processing Capacity
Routine Information-Processing Capacity	Rules & programs (H) Single-cycle planning (H) Post-action control (H) Stand-alone computer systems (H)	Integrated database computer systems (H)
	Vertical information systems: assistants, clerical staff, & planning staff (M)	Steering control (M) Multi-cycle, interactive planning systems (M)
Nonroutine Information-Processing Capacity	Hierarchical referral (L)	Horizontal information systems: Direct contact (L) Task forces (M) Teams (M) Integrating roles (L) Matrix designs (M)

Note: The letters in parentheses indicate relative volumes of information-processing capacity
 H=High, M=Medium, L=Low.

Mechanisms that are specifically designed to provide routine-sequential information processing include rules and programs, single-cycle planning processes, post-action control systems, and stand-alone computer systems. As Figure 5 indicates, these mechanisms provide relatively high volumes of information processing and do this at relatively low cost when compared to other mechanisms. Other forms of vertical information systems such as assistants, clerical staffs, and planning staffs [Galbraith 1973] can usually handle more nonroutine information processing than the preceding mechanisms, but also tend to provide largely sequential information processing. Hierarchical referral, such as the referral of an exception or nonroutine event up the hierarchy and the transmission of a decision back down, provides a two-way flow of information that also tends to be sequential. Since managerial hierarchies can easily become overloaded, this mechanism provides a relatively low volume of information-processing capacity and usually does so at a relatively high cost.

Computer systems with integrated databases (such as airline reservation systems) that can be simultaneously shared by many users provide more reciprocal information processing, but largely for predetermined routine events. Galbraith [1973] identified a number of mechanisms that tend to provide horizontal or lateral information processing across subunits or individuals: direct contact between individuals, task forces and teams, integrating roles, and matrix designs. These mechanisms facilitate information inputs being

made in a flexible, give-and-take manner among all parties to the information-processing event, and, consequently, they are the primary providers of nonroutine-reciprocal information processing in organizations.

Several mechanisms are shown at the midway point of both axes in Figure 5, indicating that they fall between the two extremes already presented. Steering control systems (such as interim reviews by parent HQ of a foreign plant's startup), clearly provide more reciprocal information processing and can handle more nonroutine situations than post-action control systems (such as annual reviews of a subsidiary's sales and profits) [Newman 1975]. Multi-cycle, interactive planning systems also provide more nonroutine and reciprocal information processing than single-cycle planning systems. Obviously, all locations in Figure 5 are approximations. Information-processing capacities can vary considerably depending on the exact design of a mechanism, how it is implemented, and how it interacts with other aspects of an organization. Yet, the generalizations expressed in Figure 5 are both useful and necessary if one wants to build a more systematic theory about information processing in organizations.

The reader will probably have noticed that there may be some positive correlation between the routine-nonroutine dimension and the sequential-reciprocal dimension when they are used to measure actual information-processing mechanisms. Thus, many mechanisms seem to fall along a single dimension (the 45 degree diagonal in Figure 5). Mechanisms that provide reciprocal information-processing capacity seem to be able to handle nonroutine situations and mechanisms that only provide sequential information-processing capacity seem to most frequently be confined to handling routine situations. It is useful here to recall that Galbraith [1973] originally ranked his information-processing mechanisms along a single dimension, in an order that is roughly similar to that which occurs along the diagonal in Figure 5. Galbraith did not explicitly identify the routine-nonroutine or the sequential-reciprocal dimensions as underlying his ordering, but simply referred to information-processing mechanisms as varying from low to high. At a minimum, Figure 5 helps one to better understand the differences that underlie Galbraith's general ordering of information-processing mechanisms. Daft and Lengel [1986] developed a similar ordering of information-processing mechanisms based upon the relative amounts of equivocality reduction and uncertainty reduction capacity a mechanism can provide.

It is the argument of this paper, however, that the multidimensional framework in Figure 5 represents a significant extension of Galbraith's unidimensional ordering and that both the routine-nonroutine and the sequential-reciprocal dimensions need to be retained as conceptually different, even if information processing in organizations frequently reveals some correlation between them. There are three reasons supporting this argument. First, some important mechanisms do seem to lie off of the diagonal and, thus, contradict a unidimensional ordering. Second, new information-processing

mechanisms may be developed that will increasingly lie off of the diagonal. This seems especially likely in the computer-based information systems area [Huber 1990]. And third, many of the indicated mechanisms can be altered to vary along one dimension without necessarily varying along the other. For example, rules and programs can be altered to fit different contingencies or even turned into guidelines (which leaves the implementer with greater flexibility in responding to an information-processing event). Both alternatives increase the nonroutine information-processing capacity of this mechanism without changing the fact that it provides only sequential information processing between the creator and the implementers of the rule or guideline.

The conceptual framework developed in this section defines four structural dimensions and four process dimensions that are to be used to measure information processing in MNCs. The framework provides a more explicit way to measure and define information processing at the macro-level, where information processing is a useful intervening concept for evaluating an organization's fit with its strategy and environment. The following section will apply the framework to a currently important subject in international management—transnationalism. The purpose here is to illustrate how the framework can be applied and also to demonstrate that it can provide meaningful new insight into complex organizational issues.

APPLIED EXAMPLE—THE INFORMATION-PROCESSING IMPLICATIONS OF TRANSNATIONALISM

Recently there has been growing interest in new ways to organize and manage MNCs [Hedlund 1986; Perlmutter and Trist 1986; Prahalad and Doz 1987; Bartlett and Ghoshal 1989]. While details and terminology may vary, most of these proposals have at their core more multidimensional organizational designs and a wider variety of integrating and coordinating mechanisms than can usually be found in "traditional" designs. The new designs are responses to the need to compete with new strategies in an international business environment that is increasingly complex and competitive. Bartlett and Ghoshal [1989] call this new trend in strategy and organizational design "transnationalism."

Transnational strategies attempt simultaneously to realize (1) efficiency and economy through global-scale operations and global integration, (2) responsiveness to national and local differences through local differentiation, and (3) a high level of innovation worldwide through extensive learning and knowledge transfer. Traditional strategies primarily emphasize one of these. It is obvious that transnational strategies create much greater requirements for information processing between parent HQ and foreign subsidiaries and among foreign subsidiaries than is the case under more traditional strategies. Depending on the specifics of the strategy (e.g., where does product knowledge have to be locally differentiated? where does it need to be globally integrated?)

and the company's organizational structure (which according to Figure 4 provides a directory as to where different types of knowledge and decision-making capabilities are located), a variety of information-processing mechanisms (taken from Figure 5) can be employed to link together the relevant sources of knowledge and capability with the appropriate information-processing capacity (e.g., nonroutine-reciprocal information processing). This is an information-processing picture of the flexible way that organizations will need to be designed in order to implement transnational strategies.

Bartlett and Ghoshal [1989] describe the key characteristics of transnational design, as revealed in their research on companies that are moving in this direction: (1) Assets and capabilities are dispersed, interdependent, and specialized. (2) There are differentiated contributions by national units to integrated worldwide operations. (3) Knowledge is developed jointly and shared worldwide. Other characteristics include: flexibility, dropping the need for symmetry and consistency in designing HQ-subsidiary relationships, self-regulating systems, and a heavy dependence on company culture and shared values in facilitating coordination.

The information-processing framework developed in the previous section seems uniquely suited to analyze the new transnational designs that are now emerging in firms and provide useful insight into them. Four information-processing implications are particularly important to the future of transnational design.

1. The role and function of formal organizational structure may be changed.

As discussed in the previous section, formal structure is important because it provides a basis for locating, maintaining, and accessing different kinds of knowledge and decisionmaking capabilities. This is especially important in large, complex organizations like MNCs, where the range of knowledge and decisionmaking capabilities is extremely wide. A key function of formal MNC structure is that managers across the company know where specific sources of knowledge and capability lie, the locations tend to be fairly stable, and managers are generally familiar with how to access them.

Compared to traditional designs, transnational designs will tend to locate knowledge and decisionmaking capability in a more eclectic manner that is at the same time more dynamic and subject to change. For example, the Australian subsidiary may replace the parent's R&D laboratory as the center of knowledge for a new generation of product technology. The company's foreign subsidiaries are familiar with monitoring and transferring new technology from the parent's R&D laboratory (several existing information-processing mechanisms already provide the necessary linkage), but not from the Australian subsidiary. New, non-hierarchical information-processing mechanisms will have to be developed. Several years later industry trends in some countries favor yet another version of product technology that has

been developed in the company's German subsidiary for use in the local market. Again, sources of knowledge and information flows have to change. As the situation in this example becomes widespread, formal structure begins to lose its value as an accurate and stable directory of where knowledge and capability reside and how they can be accessed.

The design logic that underlies formal structure is hierarchy and symmetry. Transnational design gives up this logic in order to gain more flexibility. In the process, the organization loses some of its ability to locate and access knowledge and capability, due to the diminished role of formal structure. Thus, transnational designs need to provide new information-processing capabilities that address this loss.

2. The amount of strategic information-processing capacity for product matters must be greatly expanded.

Of the four types of information processing identified in Figure 2, strategic information processing for product matters is the type that should increase the most under a transnational strategy. Under traditional strategies and structures strategic knowledge and decisionmaking capability tends to be fairly centralized at the upper levels of product division HQs and geographical region HQs. Only with a multi-domestic or polycentric strategy does the locus of this information-processing capacity move to the subsidiary level and become diffused. Thus, most strategic decisionmaking for product matters tends to take place either through hierarchical referral or within strategic planning processes that are also hierarchically structured. As a result, there is frequently a great deal of similarity in strategic product planning across product lines and subsidiaries within a company.

An important characteristic of transnationalism is that it disperses product knowledge across foreign subsidiaries and reduces the concentration of such knowledge at the parent HQ and in home country operations. This should result in a much more complex, heterogeneous, and less hierarchical strategic planning process in transnational firms. For some product matters, strategic information processing should occur directly between concerned foreign subsidiaries, with little or no involvement from parent HQ. Other matters will need to be coordinated globally through the parent HQ. And still other matters, which primarily respond to local conditions, will be left to each subsidiary. Since these three information-processing events tend to supplement rather than replace each other, the amount and variety of strategic information-processing capacity for product matters will need to be greatly expanded in transnational as opposed to traditional MNCs.

These first two implications primarily stem from the impact of transnationalism on the location of knowledge and decisionmaking capabilities in MNC structures. They are the structural implications of transnationalism for information processing. The next issue deals with the primary process implication of transnationalism for information processing.

3. The use of nonroutine-reciprocal information-processing mechanisms will need to be significantly expanded.

Transnational designs require high flexibility in the way they link different parts of the MNC organization together. Bartlett and Ghoshal [1989:12] state: "Companies see that they can gain competitive advantage by sensing needs in one country, responding with capabilities located in a second, and diffusing the resulting innovation to markets around the globe." Thus, a transnational firm seems to need unusually high amounts of nonroutine-reciprocal information-processing capacity in order to respond to the variety of changing opportunities this strategy seeks to exploit. Figure 5 shows the various horizontal information-processing mechanisms that provide this kind of capacity. All are people-intensive, in the sense that they employ large amounts of managers' and key employees' time. They are costly and difficult to control when contrasted with more routine and sequential information-processing mechanisms. An important issue that MNCs will have to face is the extent to which they are prepared to provide large amounts of nonroutine-reciprocal information-processing capacity as they begin to embrace transnational strategies.

It is interesting to recall that matrix structure were once heralded as the inevitable design for coordinating more multidimensional international strategies [Stopford and Wells 1972; Davis and Lawrence 1977]. Yet, many MNCs were forced to abandon matrix structures when they could not successfully implement them [Bartlett and Ghoshal 1990]. Matrix structures (like transnational designs) also require large amounts of nonroutine-reciprocal information-processing capacity to coordinate and resolve conflict between the two formal hierarchies that comprise the matrix. Many MNCs adopted matrix structures without recognizing this fact or providing the required nonroutine-reciprocal information-processing capacity. As a result, conflict was frequently not resolved through lateral information processing at lower levels (as it was supposed to be), but pushed vertically up the hierarchies to be resolved at the top by hierarchical referral. In some firms that abandoned matrix structures, such as Dow Chemical, the costs of duplication and conflict resolution seem to have outweighed the benefits. In others, such as Texas Instruments, the matrix structure resulted in more severe problems: the breakdown of information processing, the overcentralization of decision-making due to the organization's inability to resolve conflict at lower levels, and serious delays in making critical decisions.

MNCs face a similar problem if they adopt transnational strategies and designs, but fail to develop the necessary nonroutine-reciprocal information-processing capacities to make them work. Here the problem is not conflict resolution between two formal hierarchies, as it was with matrix structures. Instead, it is (1) conflict resolution between some non-hierarchically organized transnational activity and the traditional hierarchy that still exists and interfaces with the transnational parts of a company, and (2) the need continually to redesign and alter transnational relationships within a company. Both of

these activities will be commonplace in transnational firms and will require an increased use of such nonroutine-reciprocal information-processing mechanisms as direct contact and meetings, task forces and work teams, liaison and integrator roles.

Bartlett and Ghoshal [1989] state that transnational firms need to rely primarily upon informal matrixing accompanied by high levels of commitment and shared values to achieve the necessary coordination. These facilitate the kind of lateral, nonroutine-reciprocal information processing we have been discussing, but do not automatically insure it will occur. Many firms may require significant changes to their culture and large-scale OD (organizational development) interventions (team-building, survey feedback, process consultation, grid OD) in order to develop the potential for high levels of nonroutine-reciprocal information-processing capacity. The costs of this may be extremely high (in some cases even prohibitive) and clearly need to be weighed against the benefits of a transnational approach.

4. There will be a much greater need for design rules at all levels of the organization.

A fourth implication of transnationalism is that the process of design itself is going to be a major problem. It must be flexible, emergent from the individual situation, and fitted to the opportunities and problems posed by a firm's technology and environment. Instead of largely imitating a well-known prototype, managers at various levels will require some kind of guidance on how to design transnational relationships, how to interface them with more traditional, hierarchical, and symmetrical parts of the organization, and when to convert emergent and informal coordination to more formal and traditional coordinating mechanisms. In short, the transnational organization requires a widely understood set of design rules that can be used to implement the various complexities of a transnational strategy by helping to create suitable flexible designs. Organizing itself becomes a new technology that almost all managers in a transnational firm must master. Such is not the case in a traditional firm, where organizing is done infrequently by relatively few people.

At present, implementing transnational designs in MNCs appears to rely too much on the simple notions of informal matrixing plus heavy doses of commitment and shared values among organizational members. More technical knowledge than is implied by this will be required to activate and maintain effective transnational designs. The information-processing model developed in the previous section provides both a design logic and a preliminary set of design rules that seem to address this problem. While other conceptual frameworks for design might also be useful, information processing seems to be one of the primary characteristics that differentiates a transnational approach from more traditional approaches to strategy and organizational design. More traditional approaches to change have typically called for

structural change, which indirectly leads to information-processing change. Transnational design generally bypasses structural change, but calls for more direct changes in information-processing capacities both within and outside of the existing formal structure of a firm. Thus, there is a need within such firms for a more comprehensive design approach and model based on an information-processing perspective of the organization.

This attempt to apply the preceding information-processing framework and model to transnationalism seems to have produced some new insight and understanding. At the present time, transnational design exists largely as an illustrated but not a conceptual form. It is explained and illustrated by discussing examples of firms that are employing it. This section has attempted to demonstrate that the information-processing framework and model can provide a more conceptual and general understanding of transnationalism, that is both useful to practitioners and can serve as a base for further research and theory-building.

CONCLUSION

This paper has sought to develop an information-processing perspective of organizational design that can be used when studying large, complex organizations, such as MNCs. To date, most rigorous attempts to build theory with an information-processing perspective have taken place in micro-level studies, where the unit of analysis has been the individual or work group. By using information processing as an abstract intervening concept to relate organizational design to the strategic and environmental conditions facing an organization, researchers can better evaluate fit between these two dissimilar and hard-to compare sets of variables. The use of more explicitly defined multidimensional frameworks (such as the one developed in this paper for MNCs) to measure both the information-processing capacities of organizational design and the information-processing requirements inherent in an organization's strategy and environment will add rigor to the measurement and evaluation of such fit.

Going back to the introduction of this paper and the two primary topics MNC research of an organizational nature has focused on, it is probable that the information-processing perspective will be of greater interest to researchers working on the first topic (the study of what kinds of organizational design contribute to effective MNC performance and under what strategic and environmental conditions one form is preferable to another). In order to further develop and extend the information-processing model presented in this paper, systematic empirical research is needed on the structural dimensions framework and the process dimensions framework, described respectively in Figures 4 and 5. As indicated, some empirical research has already been done in MNCs on the structural dimensions of information processing, while support for the process dimensions framework rests largely on conceptualization intended more for use at the micro levels of

organizations and supported by research in settings quite different from the MNCs. Research in MNCs also needs to identify and understand the capacities of new information-processing mechanisms, which Bartlett and Ghoshal [1989], Prahalad and Doz [1987], and others report are currently evolving in MNCs. It is probably reasonable to expect much more dynamism on the process side than on the structural side of MNCs. What is important for theory is that new forms of information processing be identified and understood in terms of some conceptual framework, such as the one suggested here.

Currently there is a danger that new international business strategies are being created with too little consideration for the high information-processing requirements that accompany them. Similarly, the costs of providing new forms and levels of information processing in complex organizations like MNCs need to be more explicitly understood. Finally, the risks and costs of information-processing misfit need to be taken very seriously in highly competitive environments.

The second type of MNC research described in the introduction, how MNC organizational designs change and evolve, may seem a less likely candidate for the information-processing perspective. While this paper has not explicitly explored the role such a perspective might play in theories of change and evolution, there appear to be possibilities. To the extent that evolutionary change involves the maintenance of organizational fit during transition, the framework developed above might be useful. At the other extreme, serious organizational (information-processing) misfit might be equally interesting. It should conceivably lead to failure and a more revolutionary pattern of change. Thus, the information-processing perspective would appear to be potentially applicable to theories about change and evolution as well.

Theory and science are increasingly lagging the advancement of art when it comes to the management of MNCs. Recent books and articles report on many new trends and management approaches that seem to be currently developing within MNCs. Yet the identification as well as our understanding of these phenomena lie largely outside of existing theory. Consequently, there is a pressing need for theory-building to catch up to practice. Otherwise, practice will be increasingly operating without theory. Only theory and science—not practice and art—provide the kind of abstract and generalized understanding that can be moved, with some reliability, from one situation to another and integrated with other theories of understanding.

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