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ORGANIZING FOR INNOVATIONS: CASE OF THE MULTINATIONAL CORPORATION

Abstract

Based on a study of 46 cases of innovations in nine large multinational corporations (MNCs), this paper suggests that innovations come about in such firms through four different organizational processes. Labelled center-for-global, local-for-local, local-for-global, and global-for-global, these processes differ in terms of locations of different organizational capabilities that are brought to bear for creating and implementing the innovations, as well as the nature of interlinkages between different parts of the organization that are necessary for bringing each process to fruition.

These innovation processes are facilitated by organizational attributes that are different and, to an extent, mutually contradictory. These differences create some organizing dilemmas since all the innovation processes cannot be supported by a single, feasible organizational form.

MNCs, however, create innovations through all the different processes because, instead of adopting a homogeneous organizing mode for all their dispersed organizational units (national subsidiaries), they differentiate organizational structures and processes for different parts of the company. The nature of such differentiation, studied in three of the nine companies, can be interpreted as a process of differentiated allocation of scarce and expensive coordination resources to different sub-units so as to optimise the innovative capability of the firm subject to the constraint of limited integrative and coordinative capacity.

The paper concludes with a brief discussion of the implications of these findings and interpretations for theory and research on two important topics, viz., innovations in complex organizations and headquarters-subsidiary relations in MNCs. At the broader level of organization theory, it is suggested that more structured analysis of differences within organizations must supplement existing understanding of differences across organizations for developing a more complete contingency theory than is now available.

Introduction

It was over twenty years ago that Vernon (1966) proposed the product cycle theory that identified the ability to innovate as the raison d'etre for multinational corporations (MNCs). Over the last two decades, many new theories have been proposed to explain why MNCs exist, but innovations have continued to occupy the center stage in all the diverse and eclectic approaches (see Calvet, 1981 for a brief review). The strength that allows a firm to invest and manage its affairs in many different countries is its ability to create new knowledge - to innovate - and to appropriate the benefits of such innovations in multiple locations through its own organization more effectively than through market-mediated mechanisms (Buckley and Casson, 1976; Rugman, 1982).

While theories of the multinational firm highlight the importance of innovations for the existence of such organizations, the emerging phenomenon of global competition (Hout, Porter, and Rudden, 1982; Hamel and Prahalad, 1985) has made innovations even more important for their survival. While traditionally many MNCs could compete successfully by exploiting scale economies or arbitraging imperfections in the world's goods, labour, and capital markets, such advantages have tended to erode over time. In many industries, MNC's no longer compete primarily with numerous national companies, but with a handful of other giants who tend to be comparable in terms of size, international resource access, and world-wide market position. Under these circumstances, the ability to innovate and to exploit those innovations globally in a rapid and efficient manner has become essential for survival and perhaps the most important source of a multinational's competitive advantage.

In sharp contrast to this practical importance, the topic of innovations in MNCs has received relatively little research attention. Not one of the over 4000 studies on the topic of innovations (for references, see Gordon et al, 1975; Kelly and Krantzberg, 1978; Mohr, 1982) has focused specifically on the innovation process in the setting of a multinational corporation. Similarly, in the field of management of MNCs, past research has overwhelmingly focussed on strategy, defined implicitly as the way to enhance efficiency of current operations (see Ghoshal, 1986:b for a review), or structure, with most attention paid to the determinants of headquarters-subsidiary relations as opposed to their consequences. While some efforts have been made to investigate certain isolated aspects of innovations in MNC's - such as Rondstadt's (1977) study on global R&D or Harrigan's (1984) normative

proposals for global exploitation of innovations created by MNC subsidiaries - the issue of management of innovations has remained peripheral to research on the topic of management of multinational corporations.

The Innovation Process: Special Case of the MNC

The innovation process is one of the most complex of all organizational processes, and any stylized representation of this complexity cannot but be guilty of oversimplification. However, past research has suggested a generic stages model which has proved to be durable and helpful as a starting point for investigating innovations as an organizational process (as different from the view of innovations as outcomes or events).[1] This model, shown in figure 1, views the innovation process as consisting of three sequential but also interacting sub-processes of sensing, response, and implementation.[2]

[Figure 1 about here]

To innovate, a firm must sense changes that may demand adaptation or allow exploitation of an internal capability. The acquired stimuli must then be addressed through the firm's response mechanisms: technologies and products must be developed, processes must be improved or adapted, or an available capability must be converted into a functional form that satisfies a latent, emerging, or existing demand. Finally, the innovation must be exploited through efficient and effective implementation.

As suggested earlier, this is a highly simplified representation of a complex organizational process. In practice the different stages may be neither as discrete, nor as neatly sequential (Gross et al, 1971; Ginzberg and Reilly, 1957). In any specific case, it may be extremely difficult to specify where the sensing process ends and the response process begins, or at what point the implementation phase may be said to have commenced. Similarly, the sequence suggested in the model, while logical, is not an invariant order of events. In reality, the process may be much more iterative, or even circular, with a high degree of interaction among all the three stages (Zaltman et al, 1973).

Despite its simplicity, the model provides a useful starting point for analyzing the administrative tasks of organizing for innovations. To

innovate, a firm must develop appropriate capabilities to sense, respond, and implement. But just the capabilities are not enough; the firm must also create appropriate linkages to tie these capabilities together so that they function in an integrative manner. These two dimensions, viz., the configuration of organizational capabilities and the nature of their interlinkages provide, in Roethlisberger's (1977) terms, a "walking stick" for exploring the phenomenon of innovation-organization links.

These two dimensions also suggest some of the special problems faced by multinational corporations in organizing for innovations. The problems arise both with regard to the configuration of organizational capabilities and the complexity of maintaining the required interlinkages among them. These problems can perhaps be best explained in the context of a specific example.

Philips, the consumer electronics giant, has long held a leading position in the mature but profitable electric shaver business. Its Philishave is sold world-wide, but has particularly strong market positions in Europe and North America. In recent years, this rather traditional and stable product category has been shaken up by Japanese companies trying to fight their way into an established market with new, clearly differentiated product ideas. The most important innovations have been in the area of miniaturization, rechargeability, and most radically, the concept of wet shaving with an electric razor.

For Philips, the new technologies and product concepts were important trends that had to be fully understood and closely monitored, and its Japanese subsidiary had to play a critical role in this sensing task. However, the company's technological resources for this product were concentrated in its central research laboratories and development groups, and their involvement was essential for designing and developing the new product. Finally, while the company had to consider introducing the product in Japan to respond to the direct competitive threat, the need to do so was much more critical in Europe and North America where the company was even more vulnerable because of its larger market share. In other words, to respond effectively to the external development, Philips had to create and market a new product that required active and cooperative participation of a large number of its organizational sub-units spread across three continents.

Such instances are not uncommon in multinational corporations and they illustrate the complexity of managing the innovation process in these organizations. Not only must these companies have sensing, response, and implementation capabilities spread around the globe, they must also be able to

coordinate them and link them in a flexible and efficient manner despite the enormous physical and cultural distances that separate the various interdependent units.

The Study

This paper is based on some of the findings of a recently concluded study of innovations in nine large MNCs, viz., Philips, GE and Matsushita in the consumer electronics industry; L.M. Ericsson, ITT, and NEC in the telecommunications switching industry; and Unilever, Procter and Gamble, and Kao in the soaps and detergents industry. The choice of these industries and companies was based on the logic of maximum variety - the three industries represented very different requirements in terms of local responsiveness and global integration (Prahald, 1975; Porter, 1986); within each industry, the selected firms were comparable in terms of size and strategic positions but, because of the differences in their national origins and administrative histories, had very significant differences in their organizational forms and processes (for descriptions and illustrations of these differences, see Ghoshal and Bartlett, 1986).[3]

In each of these companies, we tried to identify as many specific cases of innovations as possible, and to document the participants' views on the organizational factors that facilitated or impeded the innovation process. To this end, 184 managers of these companies were interviewed, both at the corporate headquarters and also in their national subsidiaries in the United States, U.K., Germany, Italy, Japan, Singapore, Taiwan, Australia, and Brazil. None of the interviews lasted less than an hour and some took as long as three to five hours. We also collected and analyzed relevant internal documents relating to the histories of these innovations. This effort led to identification of 46 cases of innovations that provided our core data base (to save space, we do not list the cases here but readers may refer to Ghoshal (1986:a) for brief descriptions of 38 of these cases).

Analysis of these cases led us to identify four different organizational processes through which innovations came about in the sampled Companies. Each of these processes appeared to be facilitated by a set of organizational attributes that were not only different but also somewhat contradictory. In the following section we will describe these different multinational innovation processes, the organizational attributes that facilitate them, and

the organizing dilemmas that arise because of the contradictions among those attributes.

To this point, our study was based on individual innovations as the unit of analysis. The dilemmas we hypothesized were inductively derived from observing the organizational processes associated with different innovation cases in nine vastly different companies. If each company was assumed to conform to one particular organizational form, the innovation process - organizational form associations we hypothesized would suggest that each company could create innovations only through the particular process that "fitted" its organizational characteristics. In reality, however, most of these companies, in the totality of their world-wide organizations, were able to create innovations though all the different processes. This suggested the need to explore the same issue of innovation-organization linkages with individual companies as our level of analysis. To this end, we carried out a follow-up questionnaire survey within three of these nine companies. In each company, for five to eight different subsidiaries, we measured the subsidiary's contributions to the different innovation processes of the firm, and also their relevant organizational attributes that our case-based research had hypothesized as having some influence on those processes.

The actual methodology of this survey and the measurement system adopted is described in a latter section of this paper along with its principal findings. Overall, the survey supported the associations between the innovation processes and different organizational attributes that we had earlier observed, but also provided some interesting answers to the question we had posed, viz., if the contradictions we hypothesized were true, how could any single company create innovations through all the different processes? It appeared that the companies significantly differentiated their internal configuration of resources, and their internal coordination and control processes so that different parts of their organizations had very different organizational and resource contexts and this internal variety allowed them to support a variety of innovation processes. In the concluding section of the paper, we discuss some of the implications of these findings for existing theory and further research on the two streams of literature on which this study was grounded, viz., innovations in complex organizations and headquarters-subsidiary relations in multinational corporations.

The Different Innovation Processes in MNCs

The 46 cases we studied represented a wide variety of innovations. Some of them were technological innovations, such as development of a new product or manufacturing process; others were managerial innovations, such as a new organization structure or a novel way to motivate employees. As viewed by the innovating organizations, some of these innovations were relatively minor, some were major, and a few were of the kind that Gluck (1984) described as "big bang" innovations, representing situations when management put the future of the company on the line to develop and implement a radically new product, technology, or market strategy.

Analyzing these cases in terms of the process model shown in figure 1 revealed four different patterns in the organizational process through which these innovations came about. These patterns differ in terms of both the location of sensing, response, and implementation capabilities that were brought to bear for creating and implementing the innovations, and the nature of interlinkages between the capabilities that were required to bring the total process to fruition. Each of these patterns represents a different organizational process; collectively they suggest a scheme for classification of innovation processes in multinational corporations. Table 1 summarizes this classification scheme and provides a few examples for each of these processes.

[Table 1 about here]

<u>The center-for-global innovation process</u>: Center-for-global innovations are those where the center, i.e., the parent company or a central facility such as the corporate R&D laboratory creates a new product, process, or system for world-wide use.[4] Most instances of center-for-global innovations that we came across in the course of our study were technological innovations but they were spread around a wide spectrum from very minor modifications to very substantial reorientations (Norman, 1971). Most of the cases involved no participation of the national subsidiaries except for relatively routine tasks such as marketing support or nominal assembly at the implementation stage. In some others, one or more national organizations also contributed in relatively minor ways in the sensing process, while the response task, in all cases, was entirely carried out at the center. The process by which L.M. Ericsson, the Swedish manufacturer of telecommunications switching and terminal equipments, created the AXE digital switch is one example of this innovation process.

Impetus for the AXE came from early sensing of both shifting market needs and emerging technological changes. The market signal was the loss of an expected order from the Australian Post Office, a long-term client of the company. The technological signal was the early indication that CIT-Alcatel, a small French company virtually unknown outside its home country, was on to something exciting with its new digital switch, the E10. Both the developments took place in the late 1960's and led to a high level of internal discomfort at the corporate headquarters of the company that set in motion a formal review process to evaluate the overall strategic position of the firm vis-a-vis its major competitors. The review suggested that none of the products of the company possessed any significant competitive edge over rival products. It also germinated the idea for a radically new system - a new switch, based on new concepts and a new technology. That idea was AXE (originally called AX, latter renamed as AXE).

At this stage, the choice for the company was to either use available development resources for upgrading existing products, or to divert them, and much more, for developing a new and unproven technology to build an altogether new switch. The problem was not merely one of cost - to develop the new product would require over 50 million dollars and about 2000 man-years - time was also of the essence. If the company put its bet on the AXE system, it would take at least five years before the new product could be offered in the market. In that time, competitors would certainly improve their existing products, leading to Ericsson's systems becoming increasingly unattractive. Even if the new product turned out to be spectacular, the intervening period could erode the company's competitive position beyond repair.

In sharp contrast to almost all the "principles of innovation" proposed by Drucker (1985), corporate managers of Ericsson decided to place their bet on the AXE proposal. The process they adopted was not "incremental" (Quinn, 1985), unless the term is so defined as to be all encompassing. A detailed, event-by-event documentation of the history of the switch by a key participant in the development process (Meurling, 1985) shows little "controlled chaos" but rather the deliberateness and committment of a programmed reorientation (Norman, 1971). The company provided full authority and all resources so that Ellemtel, the R&D organization that was a joint venture of Ericsson and the Swedish telecommunications administration, could develop the product as quickly as possible. The technological resources of the company, including the best of its engineers, were marshalled from around the world and were devoted exclusively to this task. The development was carried out entirely in Sweden, took four years, and cost much more than the 50 million dollars that had been

budgeted originally. But, by 1976, the company had the first AXE switch in operation, and by 1984 had installed the system in 59 countries around the world.

Not all the cases of center-for-global innovations that we documented were as effective as the AXE. NEC, for example, designed the NEAC 61 as a global digital switch and developed it through its traditional centralised development process. However, while the Japanese engineers at the corporate headquarters had excellent technical skills, they were not totally familiar with the highly sophisticated and complex software requirements of the telephone operating companies in the United States, the principal market at which the product was aimed. The result was that while the switch was appreciated for its hardware capabilities, sales suffered because the software did not meet some specific needs of end users that were significantly different from those of Japanese customers.

The local-for-local innovation process: Local-for-local innovations are those in which a particular national subsidiary of the MNC creates and implements an innovation entirely at the local level. In other words, the sensing, response, and implementation tasks are all carried out within the subsidiary. Most cases of such innovations that we came across tended to be market led rather than technology driven and usually involved only minor modifications of an existing technology, product, or administrative system.

The ability of its local subsidiaries to sense and respond in innovative ways to local needs and opportunities has been an important corporate asset for Unilever. While advanced laundry detergents did not sell well in huge markets like India where much of the laundry was done in streams, a local development that allowed synthetic detergents to be compressed into solid tablet form gave the local subsidiary a product that could capture a significant share of the traditional bar soap market. Similarly, in Turkey, while the company's margarine products did not sell well, an innovative application of Unilever's expertise in edible fats allowed the company to develop a product from vegetable oils that competed with the traditional local clarified butter product, ghee.

As with center-for-global innovations, local-for-local innovations are not always as effective. In Philips, for example, the British subsidiary spent a large amount of resources to create a new TV chassis that would be specially suitable for the local market. The final product was almost indistinguishable from the standard European chassis that the parent company was trying to

introduce, and resulted in the company having to operate five instead of four television set factories in Europe.

The local-for-global innovation process: Local-for-global innovations are those which emerge as local-for-local innovations, are subsequently found to be applicable in multiple locations, and are then diffused to a number of organizational units. The following case, observed in the British subsidiary of Philips, is illustrative of this innovation process.

This subsidiary thoroughly reorganized the structure of its marketing division based on a review of changes in the product distribution system. Concentration in the distribution channels for consumer electronics products in the British market had increased enormously from 1970, when 200 buying points contributed 50 percent of the market, to 1984, when 26 buying points accounted for 65 percent of the market. There was also a clear need to differentiate marketing efforts for the different products based on their technological maturity. New and technologically advanced products such as laser vision and compact disc players were highly marketing intensive, were sold in small volumes but yielded relatively high margins, and acted as image engines that promoted sales of other products. A second class of products such as colour TV sets and VCRs were comparatively mature and needed only moderate selling efforts, though they accounted for a large share of total revenues. Finally, products at the declining stage of their life cycles such as magnetic tapes, portable cassette players, and black and white TV sets needed minimum marketing support and had to be handled at very low selling and overhead costs.

The traditional marketing organization of Philips operated with a standard set of distribution, promotion, and sales policies that were applied uniformly to all product lines. This organization was totally inadequate to interface effectively with the large-volume reseller chains or to differentiate marketing strategies to suit product characteristics. To cope with this problem, the U.K. subsidiary abolished this uniform structure for each product line and organized the marketing department into three groups; an advanced system group for dealing with the technologically sophisticated new products, a mainstay group for marketing high volume mature products, and a mass group for mass merchandizing of the older, declining products. The design was based on the idea that each product, over its life cycle, would pass through the different groups. The advanced product group would provide the initial intense marketing efforts required for establishing the product, for servicing the special needs of early adopters, and for creating the appropriate

distribution channels. Once established in the market, the product would pass on to the mainstay group, and the advanced group would move on to the next new product that should have come along by then. The mainstay group would similarly pass on the product to the mass group as the product matured and assumed the characteristics of other mass products.

Within the first year of implementation of the new structure, it appeared to fulfill its objectives. Aggregate selling expenses of this subsidiary for consumer electronics products had fallen from 18 to 12 percent and sales had risen by 49 percent while the local market demand had fallen by 5 percent. Sales to Dixons, the largest reseller chain had increased by 400 percent.

Further, it was also clear at the corporate level that many of the external factors that necessitated the change in the U.K. also existed in most other European countries. Increasing concentration in the distribution channels and growing polarization of marketing intensity depending on technology level of products were not unique to Britain but were representative of general trends that were manifest all over Europe. In other words, the innovation was clearly appropriate for transfer to many other subsidiaries.

Over the last two years, most of the European subsidiaries of Philips have adopted this new organization structure. Some, such as the German subsidiary, one of whose key managers had informally but actively participated with the British subsidiary in developing the innovation, adopted it directly. To others, the innovation was transferred via the corporate headquarters, which was itself reorganized along the same lines. These transfers were not achieved easily in all cases, however. Resistance to adopting the structure was high among many subsidiaries, and this resistance had to be overcome gradually, through a combination of gentle pursuation and some indirect pressure.

Such difficulty in transferring innovations internally is not unique to Philips. Uneven heights of soldered leads is a common problem for manufacturers of printed circuit boards (PCB's) since the longer ends can result in short circuits. NEC's factory in Japan had identified this problem and had developed a piece of equipment for on-line testing of the lengths of the soldered ends. NECAM, the U.S. subsidiary of the company, facing the same problem many years later, reinvented the same equipment with only marginal and inconsequential improvements. Similarly, management of Unilever was unable to transfer a zero phosphate detergent developed by its German subsidiary to other European locations. Insisting that its market needs were different, the

French subsidiary proceeded with its own zero-P project. Such instances of inability to identify and diffuse potentially transferrable innovations within the organization appeared to be common in all the companies we surveyed.

The global-for-global innovation process: Global-for-global innovations are those that are created by pooling the resources and capabilities of many different organizational units of the MNC, including the headquarters and a number of different subsidiaries, so as to arrive at a jointly developed general solution to an emerging global opportunity, instead of finding different local solutions in each environment or a central solution that is imposed on all the units. As an ideal type, this category of innovations involve participation of multiple organizational units in each of the three stages of sensing, response, and implementation. However, the key feature that distinguishes it from the other categories is that the response task is shared, instead of being carried out by a single unit. One of the best examples we observed of this mode of innovation was the way in which Procter and Gamble developed its global liquid detergent.

When Unilever's U.S. success with Wisk demonstrated the potential of the heavy duty liquid detergent category, P&G and Colgate rushed to the market with competitive products (Era and Dynamo, respectively), but with limited success. All three companies tested their products in Europe, but due to different washing practices and superior performance of European powder detergents which contained levels of enzymes, bleach, and phosphates not permitted in the United States, the new liquids failed in all these test situations. But P&G's European scientists remained convinced that they could enhance the performance of the liquid to match the local powders. After seven years of work they developed a bleach substitute, a fatty acid with water softening capabilities equivalent to phosphate, and a means to give enzymes stability in liquid form. Their new product beat the leading powder in blind tests, and the product was launched as Vizir, establishing the heavy duty liquid segment in Europe.

Meanwhile, researchers in the U.S. had been working on a new liquid to replace Era which had failed to establish a satisfactory market share against Wisk. The challenge for liquids in the U.S. was to deal with the high-clay soil content in dirty clothes, and this group was working on builders, the ingredients that prevent redisposition of dirt in the wash. Also during this period, the company's International Technology Coordination Group was working with P&G scientists in Japan and had developed a more robust surfactant (the ingredient that removes greasy stains) making the liquid more effective in the cold water washes that were common in Japan. Thus, the units in Europe, the

United States, and Japan had each developed effective responses to its local needs, yet none of them had cooperated to share their breakthroughs.

When the company's head of R&D for Europe was promoted to the top corporate research job, one of his primary objectives was to create more coordination and cooperation among the diverse local-for-local development efforts. Through several important organizational changes, he was able to develop the means for cooperation, and the world liquid project became a test case. Plans to launch Omni, the new liquid the U.S. group had been working on, was shelved until the innovations from Europe and Japan could be incorporated. Similarly, the Japanese and the Europeans picked up on the new developments from the other laboratories. Joint effort on the part of all these groups ultimately led to the launch of Liquid Tide in the U.S., Liquid Cheer in Japan, and Liquid Ariel in Europe. All these products incorporated the best of the developments created in response to European, American, and Japanese market needs.

Associations Between Innovation Processes and Organizational Forms

In the course of the study, we came across a number of cases of each of these categories of innovations. The specific organizational contexts varied widely for the different cases within the same category, as did the nature of the innovations themselves (in terms of traditional categorization schemes such as major-minor, technological-managerial, etc.). Space limitation prevents a case-by-case discussion of the organizational factors that were associated with the different innovation processes (interested readers can find some details in Ghoshal, 1986:a). However, each of the four categories of innovations appeared to be facilitated by a particular set of organizational attributes (see table 2).

[Table 2 about here]

Center-for-global innovations - the centralized hub: Three organizational attributes tended to be associated with most of the cases of center-for-global innovations. Collectively, these attributes represent a management system that closely resembles the "centralized hub" model of MNC organization described by Bartlett (1984).

First, such innovations are created on the strength of resources and capabilities that are available at the center. Companies such as Matsushita

and NEC, which had traditionally centralized developmental capabilities and slack resources, appeared to have an advantage in creating such innovations compared to companies such as Philips and ITT, whose resources and capabilities were dispersed among the different national units. Centralization of organizational slack appeared to facilitate center-for-global innovations not only through greater economies and effectiveness in the central sensing and response tasks, but also by making the subsidiaries dependent on the headquarters for critical resources and thereby establishing central authority for getting such innovations implemented without resistance.

A high degree of integration among different functions within the headquarters also appeared to be necessary to achieve unity of effort among the sensing, responding, and implementing functions, all of which were generally carried out at, or controlled from, the center, at least initially. Integration within the headquarters was also necessary for unity of direction to the subsidiaries so that they could be effective in whatever limited sensing and implementing tasks that might be entrusted to them.

The third requirement, which follows from the first, was strong centralization of authority at the headquarters. Centralization, along with tight strategic and operational control, facilitated efficient implementation and also allowed the headquarters to capture slack resources at the subsidiaries, if any, to support the central sensing and responding tasks.

Local-for-local innovations - the decentralized federation: Dispersed sensing, response, and implementation capabilities that allowed each unit of the company to adapt to changes in its own environment appeared to be the key organizational attribute required to facilitate local-for-local innovations. Companies such as Unilever, ITT, and Philips that had developed scanning capabilities in all their national subsidiaries, had distributed technological and management resources among all of them, and had developed effective integration of different functions within each national organization appeared to be more effective at creating such innovations than companies such as Matsushita, NEC, or Kao where organizational resources were largely centralized.

Availability and integration of local resources, however, were necessary but not sufficient conditions for promoting this innovation process. To be able to apply their local resources to create innovations, the subsidiaries also required a high degree of local autonomy and the freedom to pursue their own ideas despite the uncertainties that were always associated with regard to the

final outcomes. This implies relatively loose central control which tends to be based on formalized planning and financial control systems without direct headquarters intervention in either strategic or operational decisions of the subsidiary. The two conditions of local resources and autonomy were not always intertwined. For example, Matsushita captured considerable local resources when it acquired Motorola's TV business in the United States. The R&D unit attached to this operation had a record of many successful innovations prior to and immediately after the acquisition, but few thereafter as tight central control from Japan gradually changed its role to that of an application engineering unit, much to the disappointment of corporate managers of the company.

Most previous studies on organizational innovations (e.g., Burns and Stalker, 1960) have primarily focussed on such local-for-local innovations (even within a purely domestic context, by looking at innovations that were created and implemented within a particular sub-unit of the total organization). Not surprisingly, the organizational attributes that we observed as facilitating such innovations, viz., local slack resources, within-unit integration, and local autonomy, are entirely consistent with their recommendations on how to promote such innovations. In the specific context of the multinational corporation, these attributes are typical of an organizational from that Bartlett (1984) described as the "decentralized federation".

Local-for-global and global-for-global innovations - the integrated network: The organizational attributes required to facilitate both local-for-global and global-for-global innovations appeared to be quite similar. The first requirement was to develop a high level of integration and a spirit of partnership across the different organizational units through a complex coordination process that combined socialization of managers to common goals and values, formalization of systems to prevent excessive variations, and central control to provide overall direction. Second, the slack resources of each unit of the company had to be linked to those of the others through a set of reciprocal interdependencies that made inter-unit cooperation self-enforcing by making sharing necessary for each unit to meet its own local objectives. Third, to support these innovation processes, the organization also required a set of institutionalized integrative mechanisms to create two-way flows of information, people, and ideas among the different units. Collectively, these attributes are akin to those of the "integrative" organization described by Kanter (1983) or the "integrated network" model of multinational corporations proposed by Bartlett (1984).

Traditionally, centralization of authority, formalization of rules and systems, and socialization of members have been viewed as alternative mechanisms for organizational coordination and control (Pugh et all, 1968; Ouchi, 1980). Yet, in the few instances that companies like Procter and Gamble, Philips, and Ericsson could create successful local-for-global and, more importantly, global-for-global innovations, they appeared to have succeeded in creating linkages among the participating units that were based on simultaneous use of all the three coordination tools. High levels of local operational autonomy of the subsidiaries were counterbalanced by a strong central management that set clear directives and focussed organizational action on a particular set of salient goals. Well defined rules and systems that varied from the use of a CAD system in Ericsson to the "Procter way" in P&G ensured that while each unit had enough latitude to be creative, none had the freedom to violate certain pre-determined parameters. Finally, socialization of the key managers in each participating unit to a set of corporate values created the organizational context that was necessary to overcome the natural hierarchy of commitment which tends to make local needs take precedence over global needs.

While this complex and multidimensional coordination process made the global innovation processes feasible, it was the existence of tangible and truly reciprocal interdependencies made them desirable for each participating unit. As suggested by Caplow (1956) and Gamson (1961) based on their studies of coalition formation, a situation of either dependence or independence does not facilitate durable partnership among organizational units. Pooled or sequential interdependence (Thompson, 1967) is often not salient enough to influence day-to-day behavior. Reciprocal interdependence, on the other hand, makes cooperation desirable in one's own self interest. Learning from the NEAC 61 experience, NEC built up a strong software capability in the U.S. subsidiary while hardware capability continued to be centralized in Japan. The resulting interdependence in product development, though limited, allowed the company to approximate the global-for-global innovation process in subsequent development of the NEAC 61E adjunct switch.

Finally, the integrative mechanisms provide the specific vehicles and forums for actual implementation of these complex innovation processes. It appeared, however, that such mechanisms were effective only when they had clearly defined objectives and each participating unit had well articulated roles and tasks for achieving those objectives. These mechanisms had to be on-going, though not necessarily permanent, and had to be recognized as legitimate and integral parts of the organization's work processes. Eurobrand teams of

Procter and Gamble, Lead country committees in Philips, and global QC councils of NEC are some examples of such mechanisms in the companies we surveyed.

Contradictions and Tradeoffs: The Organizing Dilemmas

If the objective of a company is to facilitate only one of the different innovation processes suggested in our typology, it could try to create the organizational configuration appropriate for such innovations. In reality, however, each of these innovation processes have certain inherent strengths and weaknesses and none of the processes is a substitute for any other. In a normative sense, the challenge for MNC managers, therefore, is to create an organizational context in which all the different processes can flourish. This is difficult, however, since the organizational attributes required to facilitate the different processes appear not only to be different but to also present a set of contradictions and tradeoffs.

Center-for-global innovations are necessary because certain key capabilities of the MNC must, of necessity, remain at the headquarters both because of the administrative need to protect certain core competencies of the company, and also to achieve economies of scale and specialization in the R&D activity. However, the major risk of such a centralized development process is that the resulting innovations may be insensitive to market needs and may also be difficult to implement because of resistance from the subsidiaries in accepting a central solution. Both these strengths and weaknesses of this process are manifest in the examples of Ericsson's AXE and NEC's NEAC 61 digital switches that we have briefly described in this paper.

Local-for-local innovations are essential for responsiveness to the unique attributes of each of the different national environments in which the MNC operates. Current fascination with homogenization of national markets (Levitt, 1983) overlooks the fact that while the forces of globalization have indeed strengthened in many industries, the need for responsiveness to national demands and local differences has not disappeared, and often has increased. The examples we have discussed illustrate how Unilever benefitted from such responsiveness. But, on the negative side, as illustrated by the experience of Philips with regard to the British TV chassis, such innovations may also reflect the efforts of national subsidiaries to differentiate themselves for retaining their identity and autonomy, without any real needs, and may impose differentiation costs without any significant benefits. Also,

they may lead to considerable reinvention of the wheel as each subsidiary finds its own solution to common and shared problems.

Organizationally, attributes of the decentralized federation promote local innovations but impede central innovations, while the centralized hub model has precisely the opposite characteristics. In one case, while the subsidiaries have the slack resources and autonomy necessary to be innovative, the same factors exacerbate the problems of the NIH syndrome and make independent and resourceful sub-units resistant to accepting central innovations. In the other case, centralization of resources and authority facilitate both creation and implementation of central innovations but the peripheral organizations neither have any motivation to be entrepreneurial, nor do they have the slack required to create internal variations.

Both local-for-global and global-for-global innovations capture the MNC's potential scope economies and harness the benefits of world-wide learning. They permit the organization to take the most creative resources and innovative developments in any of its units anywhere in the world, and allow the whole company to benefit from them. In effect, these processes leverage the company's existing central and local resources by demolishing the arbitrary barriers that limit the application of local resources to strictly local tasks, and changing the assumption that only central groups can create global innovations.

The integrated network organization maximizes the overall innovative capability of the organization for not only does it facilitate these two innovation processes but also the other two. By creating strong interlinkages and partnership relations between each component of the organization and all others, it integrates the application of organizational slack resources irrespective of their location and diffuses the tension between local and global interests. To this extent, our findings fully conform to those of Kanter (1983).

But this organizational form also has its own limitations. It requires a degree of internal coordination that may be extremely expensive and wasteful. The complex interlinkages among different organizational components that are necessary to create the integrated network can overwhelm a company because of ambiguity and excessive diffusion of authority. Besides, such an organization is also the most expensive to build and maintain. Linking all the units of a diversified multinational into a single integrated network requires coordination resources that most companies simply do not possess. For example,

Philips estimated that a new system of periodic meetings that had been instituted for more effective integration of its European production plants for consumer electronics items (i.e., an incremental improvement in integration within only one function of one business in one region of the multi-function, multi-business and world-wide organization of the company) resulted in company managers having to spend 2581 person-days in one year just on travel and in being physically present to attend the meetings. Preparing for and implementing the conclusions of the meetings involved much greater time commitments. Similarly, ITT faced enormous problems in developing its System 12 digital switch through a collaborative effort of its different European subsidiaries. Trying to coordinate the efforts of the different units that were responsible for developing different components proved to be extremely time consuming and costly, leading to delays and budget overruns. This attempt to create a global-for-global innovation may well have been responsible for the failures that led to the company's recent reverses in the telecommunications business.

Innovation-Organization Associations Within Three Companies: Methodology

The relationship between the different innovation processes and organizational attributes that we have described so far were based on our analysis of a number of different cases of innovations in a host of different companies. While the associations we have drawn were grounded on our observations of similarities in organizational factors within each category of innovation processes, the sheer diversity of organizational contexts within which these cases were observed makes any generalization both difficult and suspect.

Further, for each category of innovations, we have described the facilitating organizational factors in terms of an archytype of MNC organization. Thus, if each company is assumed to conform to any one of these ideal types, it would logically follow that each company can create only the particular variety of innovation that its organizational configuration facilitates. This is perhaps valid at a gross comparative level: Matsushita and NEC have a greater degree of centralization of resources and authority compared to Philips and ITT, and they, in general, are more effective in the center-for-global innovation process while the latter companies have a superior record of local-for-local innovations. But this is not true in absolute terms since each of these companies create innovations through all or most of the different processes.

Philips has an outstanding record of local-for-local innovations - its pioneering Teletext TV set was created by the British subsidiary, its first stereo color TV set was developed by the Australian subsidiary, the "smart card" was a product of the French research laboratory, and so on. Yet, it has also created a number of highly successful center-for-global innovations. The Helium-Neon Laser that lies at the heart of compact disc players and Laser Vision sets is a prime example. We have already described a local-for-global innovation of the company. In developing dual-capacity shaving razors and projection TV sets, the company has adopted the global-for-global innovation process.

Matsushita, on the other hand, excells in center-for-global innovations, but is not completely without its own stock of innovations created through the other processes. The Singapore subsidiary of the company created a new personnel management scheme that was an excellent example of local-for-local innovations. The U.S. subsidiary played the lead role in recent redesigning of its "camcorder" (video recorder), a global product. The British subsidiary created a number of process improvements that the company has since adopted in Japan.

Such examples of multiple innovation processes within the same company appeared to be at variance with our contention that the facilitating organizational attributes for the different innovation processes were not only different but also mutually contradictory. Obviously, these companies had found ways to overcome the contradictions. To understand how they had done so required a more focussed inquiry within individual companies and three of the nine companies in our sample, viz., Philips, Matsushita, and NEC agreed to host such a follow-up study.

For reasons discussed earlier in the paper, the survey had to be operationalized at the level of individual subsidiaries in each of the three companies. Given the objectives of the inquiry, for each subsidiary, we had to measure three sets of variables, viz., the subsidiary's contributions to the different innovation processes of the firm, the level of local resources available to it, and relevant attributes of its organization including internal integration and its relationship with the headquarters. Each measure posed its own methodological problems and our solutions were often partial, representing the best compromise we could make between the need, on the one hand, for multiple indicators and respondents for measurement reliability and, on the other, for minimizing our demand for time of company managers which, for all three companies, had already reached rather alarming proportions.

We measured the subsidiary's participation in the different innovation processes through three indicators, viz., the number of innovations it had created and implemented locally (local-for-local), the number of innovations it had adopted from the parent company (center-for-global), and the number of its own innovations it had diffused to other units of the company (local-for-global). The subsidiary's participation in global-for-global innovations could not be operationalized directly, since such participation could be in many forms and in varying extents which we could not measure with any degree of reliability or comparability. However, subsidiaries that scored high on all the three indicators were assumed to have the conditions that facilitated their participation in global-for-global innovations.

All the departmental managers in each of eight subsidiaries of all three companies were asked to provide brief descriptions on the innovations that were created, adopted from the center, and diffused to other units by their departments within the preceeding twelve months. The final measure for each indicator was based on evaluation of these descriptions and some cases that were included by the respondents were excluded by us since they clearly did not qualify to be called innovations (e.g., "instituted a system for recording employee attendance"). To arrive at subsidiary level scores for these and all the other variables, we excluded from our sample all subsidiaries except those from which we had received responses from each departmental manager, i.e., had data for all the departments within the subsidiary. This allowed us to simply aggregate the total number of innovations that each manager within a subsidiary reported as having been created, adopted, and diffused by his or her department as subsidiary level scores for these variables.

We measured internal integration within the subsidiary by estimating the frequency of communication between its different departmental managers. Construct validity for this operationalization lies in the conceptual arguments and empirical evidence that have emerged from the pioneering work of Allen (Allen, 1977; Allen and Cohen, 1969; Allen et al, 1980) which suggests that communication is the key vehicle through which integration is accomplished (Stanford et al, 1976). While each manager reported the frequency of his communication with the heads of the other departments in five categories that varied from daily communication to communication less than once a year, only daily, weekly, and monthly communication was scored as 3, 2, and 1 respectively, and lower frequencies were ignored. Based on this scoring system, an internal communication density was computed for each manager as the average frequency of his communication with other managers within the subsidiary. The internal communication densities of all managers within the

same subsidiary were aggregated to arrive at a score for internal communication density for the subsidiary as a whole.

Following both existing literature and our own observations at the clinical phase of the study, the subsidiary's relations with the headquarters was operationalized through four variables, viz., the levels of local strategic and operational autonomy, extent of formalization of rules and systems, and the level of socialization of subsidiary managers to the parent company's norms and values. We measured each of these variables using theory, instruments, and scales that have been developed and used by previous researchers.

Subsidiary autonomy is a measure of the relative influence of the headquarters and the subsidiary on different decisions that affect the subsidiary. In much of the literature on headquarters-subsidiary relations in MNCs, no distinction has been made between strategic and operational autonomy (e.g., Picard, 1977; Garnier, 1982, Gates and Egelhoff, 1984). But as argued and demonstrated by De Bodinat (1975), the levels of subsidiary influence can be very different for strategic and operational decisions and, accordingly, we measured subsidiary autonomy separately for these two kinds of decisions.

The first kind was measured using three decision situations, viz., introduction of a new product, major restructuring of the subsidiary organization involving creation or abolition of departments, and recruitment and promotion to positions just below that of the subsidiary general manager. The other kind - operational decisions - were minor but significant modifications of an existing product, or in the manufacturing process, and career development plans for departmental managers. These decision situations were adopted from De Bodinat's instrument, and subsidiary managers estimated the extent of their influence on each of these six decisions on scales of 1 (low) to 5 (high). The average scores for the different decisions for each of these categories for all respondents from the subsidiary were aggregated to arrive at subsidiary level scores for strategic and operational autonomy.

Formalization was measured using an abreviated version of the instrument used by Blau and Schoenherr (1971). Both existence of rules and the extent to which rules were implemented were reported by the respondents on 5-point ordinal scales and the average for all respondents within the subsidiary was used as an aggregate measure for the subsidiary.

Following the theory of organizational socialization proposed by Van Mannen and Schein (1979), socialization of managers to parent company norms and values was measured as a composite of three indicators. The first was the extent of time the manager had actually worked in the corporate headquarters of the company. Managers who had worked for at least one year at the headquarters were assigned a score of one, and the others were assigned a score of zero. The second indicator was the existence of a mentor at the headquarters, scored as one if the manager felt that he had such a person, and zero otherwise. The third indicator was based on the number of trips the manager made to the headquarters. Managers who visited the headquarters at least one a year received a score of one, others were assigned a score of zero. These three scores were aggregated to yield a single composite measure of the level of organizational socialization for each respondent. The scores of all respondents from the subsidiary were then aggregated to provide a subsidiary level measure for this variable.

For these variables we could identify objective measures or, at least, reliable perceptual indicators that could be compared across the subsidiaries. This, however, was not possible for measuring the level of slack resources available to the subsidiary. We could not identify a parsimonious yet comprehensive list of resources that we could objectively measure as indicators of local slack that would be valid for all subsidiaries and could, therefore, be used comparatively. Perceptual measures from subsidiary level respondents were also unreliable because of calibration problems. For this variable, therefore, we resorted to a comparative measure at the corporate level. In each company, we identified the corporate level managers who, either because of their formal responsibilities or because of personal experience, had direct and intimate knowledge of all the subsidiaries of the company that had been included in the survey. We requested two of these managers (within each company, the population of such managers was very small) to rate, on a scale of 1 (little effect) to 5 (major disruption of activities), the effect of an immediate ten percent reduction in the subsidiary's operating budget. The scores of each subsidiary from both the corporate level respondents were aggregated and then reversed to yield an indicator of the level of slack resources available to the subsidiary. High inter-rator correlations (0.79 in Philips, 0.84 in Matsushita, and 0.76 in NEC) in the ranking of different subsidiaries led to some degree of confidence in this measurement procedure.

Finally, this corporate level survey was also used to develop some relative measures of the complexity of the external environment faced by each

subsidiary. Our focus in the study was on internal organizational attributes that facilitated innovations. Yet, both our own case-studies (for example, the global liquid project of Procter and Gamble and the dual-capacity razor developed by Philips) and the literature (Zaltman et all, 1973; Downs and Mohr, 1984) suggested the possible importance of the external environment on a subsidiary's ability to participate in the different innovation processes. It was, therefore, important to include this variable in the survey so as to avoid the possibility of erronous conclusions because of exclusion of a relevant influencing factor.

The relative merits and demerits of objective and perceptual measures of the environment are well known (e.g., Downey and Ireland, 1983). Given the methodology we had adopted, and given the diversity of environments faced by the sampled organizations, reliable and comparable objective measures were particularly difficult to find. We, therefore, obtained comparative perceptual measures by requesting both the corporate level respondents in each of the three companies to assess three attributes of the environments of each subsidiary of the company on ordinal scales of 1 (low) to 5 (high). The first two attributes, viz., technological dynamism and competitive intensity were selected based on their identification in the empirical literature as critical dimensions of an organization's task environment (for both review and a contribution, see Miller and Friessen, 1983). The third, viz., intensity of regulations, is of obvious importance in the specific context of a multinational corporation (Doz, Bartlett and Prahalad, 1981). Here again, inter-rator correlations were high[5], and the aggregates of the two respondents' scores were used as subsidiary level measures of the three indicators of environmental complexity.

Innovation-Organization Links Within Matsushita

Table 3 shows, for each of eight different subsidiaries of Matsushita, the measures of their strategic and operational autonomy, formalization of rules and systems, socialization of managers, and the density of internal communication. Analysis of variance in the scores of different respondents within and across subsidiaries, the results of which are also included in the table (F statistic) show that except for strategic autonomy, the other organizational attributes differ significantly across the different subsidiaries. Visual analysis of these differences suggest that the eight subsidiaries may be roughly classified into three groups.

[Table 3 about here]

Subsidiaries G and H report the lowest levels of strategic and operational autonomy. They also report the lowest levels of formalization of rules and systems, and relatively modest levels of socialization of managers. In other words, their relations with the headquarters is based primarily on substantive control through centralization of authority - typical characteristics of the centralized hub mode of multinational operations.

Subsidiaries E and F, in contrast, report among the highest levels of strategic and operational autonomy. They also report the highest levels of formalization of rules and systems and the lowest levels of socialization of managers. In other words, their relationships with the headquarters are based primarily on coordination through formal systems with low substantive or cultural control. These attributes correspond to those of the decentralized federation model of MNC organization that we have described earlier in this paper. These subsidiaries also report the lowest levels of internal communication.

Finally, subsidiaries A, B, C, and D reflect a much more complex and multidimensional management process. Their managers report the highest levels of socialization to the parent company's norms and values, suggesting the possibility of a relatively high level of cultural control. At the same time, these units also report moderate to high levels of formalization, suggesting moderate levels of system-based coordination and control. Overall, they enjoy high strategic and operational autonomy, though not as high as subsidiaries E and F. They also report the highest internal communication densities reflecting relatively high internal integration. This complex coordination process vis-a-vis the headquarters and the high level of internal integration are some of the key attributes of what we have described as the integrated network model of MNC organization.

Table 4 shows the innovation record of each of these subsidiaries, as well as the measures of their local slack resources and environmental attributes. The four subsidiaries that conform to the integrated network mode of operations also have the best record of participation in the different innovation processes of the firm. They report the largest number of local innovations as well as the most extensive adoption of central innovations. They are also the only ones to diffuse their innovations to other units of the company.

[Table 4 about here]

E and F, the two subsidiaries that appear to be managed in the decentralized federation mode also reflect the pattern of innovations we would expect based on the findings of our earlier case-based research. They create a significant number of local innovations. However, they remain relatively isolated from the central and global innovation processes, neither adopting others' innovations, nor diffusing any of their own. Subsidiaries G and H, the two that conform to the centralized hub mode of operations, create the least number of local innovations, do not diffuse any, but adopt central innovations. Here again, the pattern of innovation-organization linkages is not contrary to our expectations.

Analysis of the environmental attributes and local slack resources yield no surprises. The integrated network subsidiaries are located in environments that have the highest levels of competitive intensity and technological dynamism. With one exception (a very large subsidiary in a major Latin American country), these are also the least regulated markets. These subsidiaries also possess relatively the highest levels of local slack resources. For the other four subsidiaries, the differences in local environments and resources are blurred though the environments of the two decentralized federation subsidiaries appear to be somewhat less competitive, less technologically dynamic and more regulated than those of the two centralized hub units.

Innovation-Organization Links in Philips and NEC

Identical analysis based on data obtained from five subsidiaries each of Philips and NEC showed similar patterns of internal differentiation and also similar associations between the different organizational attributes and the subsidiary's innovation records. To save space, we do not reproduce the data here but they have been reported fully in Ghoshal (1986).

In Philips, the subsidiaries could be grouped in two categories that roughly correspond to the integrated network and the decentralized federation modes of operations. The first group, consisting of a major European subsidiary and a large scale operation in a south East Asian Country that hosts one of Philips' global-scale production plants, reported significantly higher levels of socialization of managers and internal communication densities, and relatively lower levels of operational autonomy compared to the other three. For both strategic autonomy and formalization of rules and systems, there were no observable differences among the five subsidiaries.

The two subsidiaries in the first group reported significantly higher numbers of local innovations and also adoption of central innovations. They were also the only ones to diffuse their innovations to other units of the company. Among the five subsidiaries, they also had the highest levels of local slack resources and faced the most competitive, technologically dynamic, and least regulated environments.

In NEC, similarly, there were two groups, though they conformed to the integrated network and the centralized hub modes, with the former group showing higher socialization, formalization and operational autonomy compared to the latter. This group also created greater numbers of local innovations and one of the two subsidiaries in this group was the only one among the five to diffuse its innovations to other parts of the company. All five subsidiaries reported some cases of adoption of central innovations. The levels of local resources and the environmental conditions of the subsidiaries were also consistent with the findings in the other two companies: the integrated network subsidiaries faced environments that were technologically more dynamic, more competitive, and less regulated compared to the three centralized hub subsidiaries.

To summarize the findings from these three companies, the associations between the different innovation processes and the different organizational forms that we had discerned in the clinical phase of the study were generally confirmed in the surveys. The centralized hub mode of operation supports central innovations but not local or global innovations; the decentralized federation mode facilitates local innovations but not the other two; while the integrated network mode supports all the innovation processes. However, the more interesting finding was that individual companies could still create innovations through all the different processes since the overall configurations of their world-wide organizations were not homogeneous but were internally differentiated. Different parts of the company faced different internal organizational contexts and each contributed primarily to those innovation processes that its own context facilitated. While our methodology cannot support any causal logic, the findings are not inconsistent with the argument that the nature of internal differentiation reflects a process of optimizing the innovative capability of the firm subject to the constraint of limited coordination resources.

Those organizational components of a multinational (or, theoretically, any multi-unit organization) that are located in complex environments and possess significant levels of local resources have greater opportunities to create

local-for-local innovations and also to contribute to global-for-global innovations. These are also the locations where center-for-global innovations are first implemented. Besides, in a globalizing environment, local innovations created by these subsidiaries often become useful in other locations since trends that are first manifest in their environments often diffuse to others. Our findings in the three companies suggest that these are the subsidiaries that they manage in the integrated network mode.

In contrast, other subsidiaries that are located in less-stimulating environments and do not have access to critical organizational resources, are managed in the more traditional modes of a centralized hub or a decentralized federation. The factor that influences the choice between these two modes may well be the level of local regulations that affect the organization's freedom to structure internal exchange relationships. In highly regulated environments the decentralized federation mode may be preferred while in less regulated environments the centralized hub form may prevail. Clearly, the choice is also influenced by the culture and administrative history of the firm: in Philips, the decentralized federation form may be more feasible, in general, compared to the centralized hub form while in Matsushita the reverse may be true.

Such internal differentiation appears logical if one assumes that a firm's coordination resources are both expensive and limited. Given the high investment of this resource that is required to create the maintain the integrated network, a firm admits to the network only those units that can potentially yield a high return on the investment. For the other units, it achieves coordination and control through mechanisms that are less complex and expensive, i.e., either centralization or formalization. Collectively, then, the overall organization of the firm becomes one that may be described as a differentiated network where different parts are managed differently, based on different levels of investments of coordination resources.[6]

Implications for Theory and Research

Recently a number of well known authors have presented their prescriptions on how large companies can be organized so as to remain innovative. Their conclusions, though couched in different terminologies, have been remarkably similar. To be innovative, a company must have an "integrative organization" (Kanter, 1983). "Incrementalism" and "controlled chaos" must prevail (Quinn,

1985) in an environment that de-emphasizes planning and programming (Drucker, 1985). It must foster informal "skunk-works" and individual creativity (Peters and Waterman, 1982). In essence, these authors have restated, elaborated, extended, and supported the conclusions reached by Burns and Stalker (1961) about a quarter century ago. To remain innovative, an organization must be "organic": it must disperse its resources, must decentralize control over those resources, and must create an environment of intense internal communication so as to make "grass-root" innovations both feasible and desirable for organizational members. Conceptually, as discussed by Burgelman (1984), all these proposals can be seen as overlapping schemes for variety enhancements within organizations.

Our description of the four innovation processes in multinational corporations and of the dilemmas posed by the organizational factors that facilitate them suggest some constraints to the extents to which these prescriptions can be generalized. In particular, three reservations arise.

First, all these authors prescribe at the level of total organizations but limit their studies to the attributes and characteristics of organizational sub-components. In the case of Burns and Stalker, this is stated explicitly as the level of analysis, "The twenty concerns which were subject of these studies were not all separately constituted business companies. This is why we have used concern as a generic term ..... (some of them) were small parts of the parent organization". The other researchers similarly observe a district sales office of General Electric, or a department in the headquarters of 3M, or a divisional data processing office of Polaroid, but not the overall organizational configuration of any of these companies. But, while drawing normative conclusions from their observations and findings, they assume that attributes that are desirable within organizational sub-components are also desirable and feasible for the total organization. In this assumption they deny the possibility that there may be tradeoff's between integration and differentiation within organizational sub-components and those across them (Lorsch and Lawrence, 1965). By ignoring this difference between the levels of analysis and prescription, they assume away or de-emphasize a whole set of organizational dilemmas that are faced by managers in complex multi-unit organizations.

Second, the overall innovation process includes both the processes of creating an innovation and of implementing it. The prescriptive literature tends to underemphasize the problems that arise because of the interactions between these two processes. A number of other researchers have argued that

organizational characteristics that facilitate creation of innovations may be contradictory to those that facilitate implementation (Wilson, 1966; Sapolsky, 1967). In fact, Kanter herself notes this contradiction, "After all, it can often be easier and faster to implement nearly anything in a centralized authoritative manner, if it does not require much change from others". The integrative organization she describes overcomes the contradictions between innovation and implementation as long as both the processes are carried out within the same organizational unit. But, as we have illustrated in the case of MNCs, the real problem for many organizations is that the two processes may be carried out in two different organizational units.

The organizational attributes that promote innovativeness within individual sub-units may not be those that facilitate joint action on the part of different sub-units to generate and implement a common innovation. On the contrary, research on the Not Invented Here (NIH) syndrome as well as a broader stream of research on political processes in complex organizations (March, 1962; Pfeffer and Salancik, 1974; Salancik and Pfeffer, 1974) provide ample evidence that organizational characteristics that promote cooperation among sub-units may be quite the opposite of those which promote entrepreneurial behavior of individual sub-units.

Finally, and this is the point we would like most to emphasize, these authors do not consider the organization's costs for buying their prescriptions. The coordinative resources required to integrate an organization multiplies geometrically as the size of the organization increases. Thus, in relatively small organizations, or within small sub-units of large organizations, the integrative form is feasible and is perhaps also cost-effective. But in large, multi-unit organizations across the board integration of all components may be neither feasible nor efficient. This imposes the need for making choices and for internal differentiation. By dichotomizing complex organizations as organic or mechanistic, or as segmentalist and integrative, these authors assume a level of internal homogeneity within these organizations that is unrealistic and that tends to hide more than it reveals.

This issue of internal differentiation also has some significant implications for a very different stream of literature, viz., headquarters-subsidiary relations in multinationals. This topic has received considerable attention from researchers but, with some limited exception (e.g., Hedlund, 1981), the empirical studies have been based on the assumption that the nature of its relationship with the headquarters is similar for all subsidiaries of a multinational. This assumption is manifest in many different ways. Findings

from data acquired from the subsidiaries of many different MNCs located in a single national environment have been used to draw general conclusions regarding the extent of centralization in MNCs of different parent nationalities (Hulbert and Brandt, 1980). Theory derived propositions such as the need for fit between structure and information processing requirement (Egelhoff, 1982) or between organizational form and characteristics of the task environment (Kogono, 1981) have been investigated based on single company level measures of structural variables for the company as a whole. Even for studies that have explicitly focussed on the contingency effects of different subsidiary characteristics on the structure of multinational corporations, while variables such as subsidiary size, age, etc. have been measures separately for different subsidiaries, a single company level measure has been used for variables such as centralization (Gates and Egelhoff, 1984).

The findings of this stream of research has been a series of contradictions with different studies showing positive, negative or no association between the structural variables and a range of corporate or subsidiary level attributes. Gates and Egelhoff (1984) have summarized these contradictions in the findings of past research on centralization in MNCs, but their own effort, grounded in the same assumption of intraorganizational homogeneity, has merely added another set of scattered data points without resolving the confusion in any way.

Our findings suggest that the problem with these studies may well lie, not in their measurements, but in the implicit assumption that variables such as centralization can be operationalized and measured at the level of the total organization for highly diversified firms such as a multinational corporation. For such structural attributes, internal differences within these firms may well exceed differences in average levels across firms. To cite an example from our data, a comparison of the levels of autonomy of Philips and Matsushita subsidiaries will show the latter company to be more centralized if the study was conducted in Germany, and exactly the reverse if it was carried out in Columbia.

There are differences both among and within organizations. Much of the effort of organizational theorists over the past two decades have focussed on developing a contingency model for explaining differences of the first kind. Yet, given the increasing proliferation of multi-unit organizations the different parts of which face very different external contexts, a contingency model will remain incomplete till the internal differences within organizations are also encompassed within a broader theoretical framework.

This is the work that was initiated by Lawrence and Lorsch (1967) but little has been accomplished since their pioneering venture. At the broadest level of theory and research, the most important implication of the rather exploratory study we have reported in this paper is to draw attention to the need for more systematic analysis of internal variations within organizations so as to provide the much needed missing half of a complete contingency model.

Notes

1. The term "innovation" has been defined in many different ways. However, these definitions can be broadly classified into two categories: those that see innovation as the final event - "the idea, practice, or material artifact that has been invented or that is regarded as novel independent of its adoption or nonadoption" (Zaltman et al, 1973:7), and those who, like Myers and marquis, see it as a process "which proceeds from the conceptualization of a new idea to a solution of the problem and then to the actual utilization of a new item of economic or social value" (1969:1). We adopt the latter definition and, throughout the paper, use the terms innovation and innovation process interchangeably.

2. The sense-response-implement model has an extensive history in multiple fields. It is directly adopted from the unfreeze-change-refreeze framework in the field of organization development proposed by Lewin and subsequently enhanced by Bennis, Schein, Beckhard, and others. For a brief review of this literature, see Lorange et al (1986). The same model, with different labels, has been adopted in the marketing field to describe the new product introduction process (see, for example, Urban and Hauser, 1984), and by many scholars who have studied the organizational innovation process (see Zaltman et al, 1973 for a review).

3. This study of innovations in MNCs was a part of a larger research project on management of multinational corporations which covered a number of issues other than management of innovations. The overall findings of the project are being reported in our forthcoming book, Managing Across Borders: The Transnational Solution.

4. The terms global and world-wide have been used somewhat loosely in the paper to imply many different national subsidiaries or environments.

5. The correlations between the ranks of the different subsidiaries as derived from the responses of the two respondents in each company are shown below. Except for intensity of regulations in the case of Philips, all the correlations are significant at the 0.05 level.

	Competitive intensity	Technological dynamism	Intensity of regulations
Matsushita	0.63	0.79	0.70
Philips	0.88	0.63	0.31
NEC	0.71	0.76	0.68

6. This idea has been further developed in Ghoshal and Nohria (1986). In this paper, we have proposed an explicit theoretical framework for internal differentiation of management processes within MNCs and have empirically tested the framework based on data on 720 cases of headquarters-subsidiary relationships collected through a survey of 66 of the largest European and North Amercian MNCs.

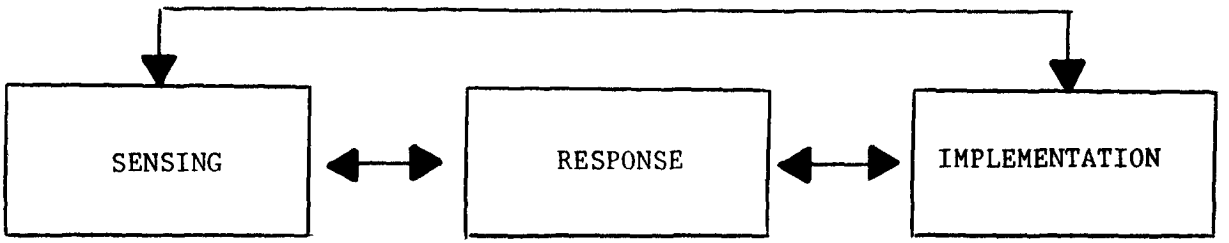

Figure 1

A Model of the Innovation Process

Table 1

Classification of Innovation Processes in MNCs

Category	No. of Cases	Examples
1. Center-for-global	17	Ericsson's AXE digital switching system Matsushita's LCD screen TV set
2. Local-for-local	13	Unilever's solid bar form detergent in India Different local versions of ITT's crossbar switching systems
3. Local-for-global	11	Ericsson's Australian rural switching system Philip's teletext TV set developed by the U.K. subsidiary
4. Global-for-global	5	Philip's projection TV Procter and Gamble's global heavy duty liquid detergent

Table 2

Facilitating Organizational Attributes for the Different Innovation Processes

Innovation Process	Facilitating Organizational Attributes	Associated Organizational Model
1. Center-for-global innovations	- Centralization of organizational capabilities and slack resources at the headquarters - High level of integration among different functions within the headquarters - Centralization of authority and decision making at the headquarters	The Centralized Hub
2. Local-for-local innovations	- Dispersion of organizational capabilities and slack resources among the subsidiaries - High level of integration among different functions within each subsidiary - Decentralization of authority and decision making to the subsidiaries with relatively loose central control through formalized systems	The Decentralized Federation
3. Local-for-local and global-for-global innovations	- High level of integration between and among the headquarters and all the subsidiaries based on a complex and multidimensional coordination process that combines high level of socialization of managers, strong formal systems, and moderate levels of subsidiary autonomy - Strong reciprocal interdependencies among all the different units - Specific mechanisms for two-way flows of information, people, and resources among all the different units	The Integrated Network

Table 3

Differentiation in Coordination Processes: Matsushita

Subsidiary	Strategic autonomy (Scale 1-5)	Operational autonomy (Scale 1-5)	Formalization of rules and systems (Scale 1-5)	Socialization of managers (Scale 1-3)	Internal communication density (Scale 1-3)
A	3.4	3.4	1.9	2.1	1.9
B	3.2	3.2	2.1	2.6	1.6
C	3.4	3.7	1.9	1.9	1.9
D	3.9	4.7	2.4	1.7	2.2
E	4.5	4.5	2.4	0.7	0.8
F	3.5	3.9	2.7	0.6	1.1
G	2.9	3.1	1.6	1.1	1.3
H	3.1	2.8	1.7	0.8	1.4
Analysis of variance within and across subsidiaries (F statistic)	1.8	4.1*	3.9*	11.2*	8.9*

* Significant at $p \leq 0.05$

Table 4

Matsushita Subsidiaries: Innovation, Resources, and Environment

	Number of Innovations				Environmental Complexity		
Subsidiary	created and adopted locally	adopted from the center	diffused to other units	Local Resources*	competitive intensity*	technological dynamism*	intensity of regulations*
A	20	3	0	3.9	4.8	3.6	1.8
B	16	8	4	4.3	4.3	4.4	1.2
C	17	6	9	5.0	4.8	5.0	1.3
D	22	12	7	4.1	3.9	3.2	3.9
E	14	0	0	2.2	2.1	2.6	4.6
F	11	0	0	3.4	3.5	3.1	3.2
G	8	2	0	3.2	3.4	3.3	3.6
H	7	4	0	2.8	3.8	3.1	3.3

* Figures reflect average of two estimates provided by two corporate level respondents on ordinal scales of 1 (low) to 5 (high). See description of measure in the text.

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