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CREATION, ADOPTION, AND DIFFUSION OF INNOVATIONS BY SUBSIDIARIES OF MULTINATIONAL CORPORATIONS

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Abstract. This paper reports some of the findings of a multi-phased and multi-method study on the organizational attributes that facilitate creation, adoption, and diffusion of innovations by subsidiaries of multinational companies. Comparison of results obtained through case research in nine companies, multiple-respondent questionnaire surveys in three companies, and a single-respondent survey in 66 North American and European multinationals reveal unambiguous and positive impacts of normative integration through organizational socialization and dense intra- and inter-unit communication on an MNC subsidiary's ability to contribute to the different innovation tasks. The findings are less consistent with regard to the effects of local resources and autonomy and it appears that the influences of these two attributes are strongly mediated by the levels of normative integration and organizational communication.

National subsidiaries carry out different tasks in the different processes through which innovations are created and institutionalized in multinational corporations (MNCs). First, they can develop and adopt new products, processes, or administrative systems locally, using their own technical and managerial resources to respond to local circumstances. We call this task "creation" and effectiveness

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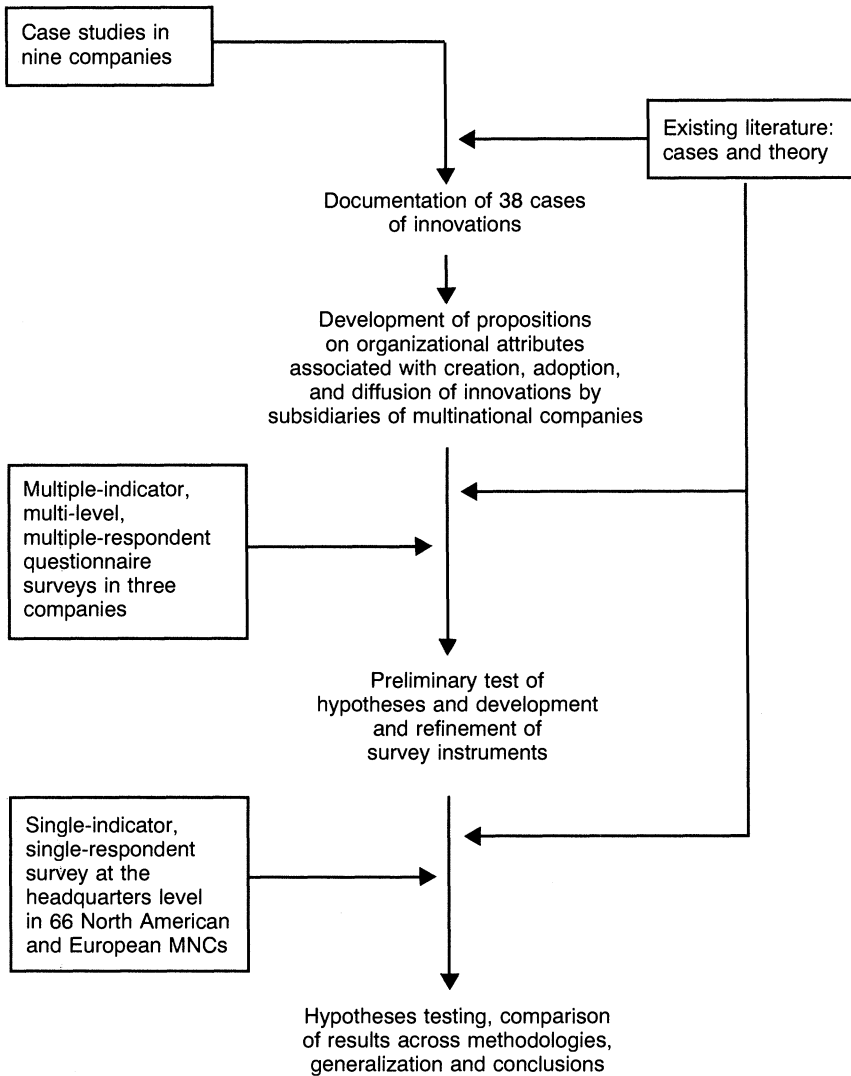
of its different subsidiaries in creating such local innovations lies at the heart of an MNC's ability to be responsive to the unique opportunities in its different operating environments. Second, the subsidiaries may be required to adopt innovations developed by the parent company, or a central R&D facility, or other national subsidiaries of the company. This is the task of "adoption," and efficiency of subsidiaries in adopting such innovations often plays a critical role in the MNC's ability to pursue an integrated global strategy. Third, subsidiaries may also be required to diffuse their local innovations to the parent company or to other subsidiaries, and the ability to facilitate such intra-organizational "diffusion" of subsidiary innovations allows an MNC to exploit the scope economies of learning inherent in its geographically diversified operations.¹

In this paper we report some of the findings from a research project we recently undertook to investigate the organizational factors that facilitate an MNC subsidiary's ability to carry out these tasks of creation, adoption, and diffusion of innovations. The project consisted of three phases (see Figure 1). In the first phase we interviewed a large number of managers in both the corporate headquarters and in a number of different national subsidiaries of nine large multinational corporations. Our objective was to identify and document the histories of as many specific cases of innovations as possible. This process yielded reasonably rich and complete descriptions of thirty-eight innovation cases in these companies. Analysis of the organizational attributes that were associated with these innovation cases led to our identification of four different generic processes through which innovations come about in MNCs (see Ghoshal and Bartlett [1987] for descriptions and illustrations of these processes) and also to a set of propositions regarding the associations among a set of organizational characteristics of an MNC and the ability of its subsidiaries to create, adopt, and diffuse innovations. These propositions, in turn, served as the hypotheses for the second phase of the study. The next section of this paper briefly describes the methodology adopted in the first phase, identifies the companies that were studied, and presents the propositions that were derived from our analysis of the thirty-eight innovation cases.

In the second phase of the project, we conducted mailed questionnaire surveys covering a fairly large number of managers in three of the nine companies. The objectives of the surveys were to formalize the hypotheses that were generated in the first phase, to carry out preliminary tests of some of those hypotheses, and to develop suitable instruments for conducting a large sample survey to test the hypotheses more rigorously in the third phase of the study. The survey process and measurement system adopted in the second phase as well as the key findings are presented in the third section of this paper.

Finally, in the third phase of the study, a single-respondent questionnaire survey was carried out at the headquarters level in some of the largest North American and European multinationals. The survey yielded data on 618 national subsidiaries of 66 companies and this data were used to further explore the hypotheses we had developed. The fourth section of this paper provides some

Figure 1
The Research Process



details of the methodology adopted in this phase of the study, and also presents the key findings.

The purpose of this three-phase research design was to seek triangulation by covering the spectrum from relatively “fine grained” to relatively “coarse grained” methodologies [Harrigan 1983] within the same project to address the same set of issues. There were both consistencies and inconsistencies in the findings from the three phases. The fifth and concluding section of the paper summarizes these similarities and differences and derives some overall

conclusions regarding the organizational attributes of MNCs that influence the innovative capabilities of their subsidiaries.

PHASE I : HYPOTHESES GENERATION THROUGH CASE RESEARCH

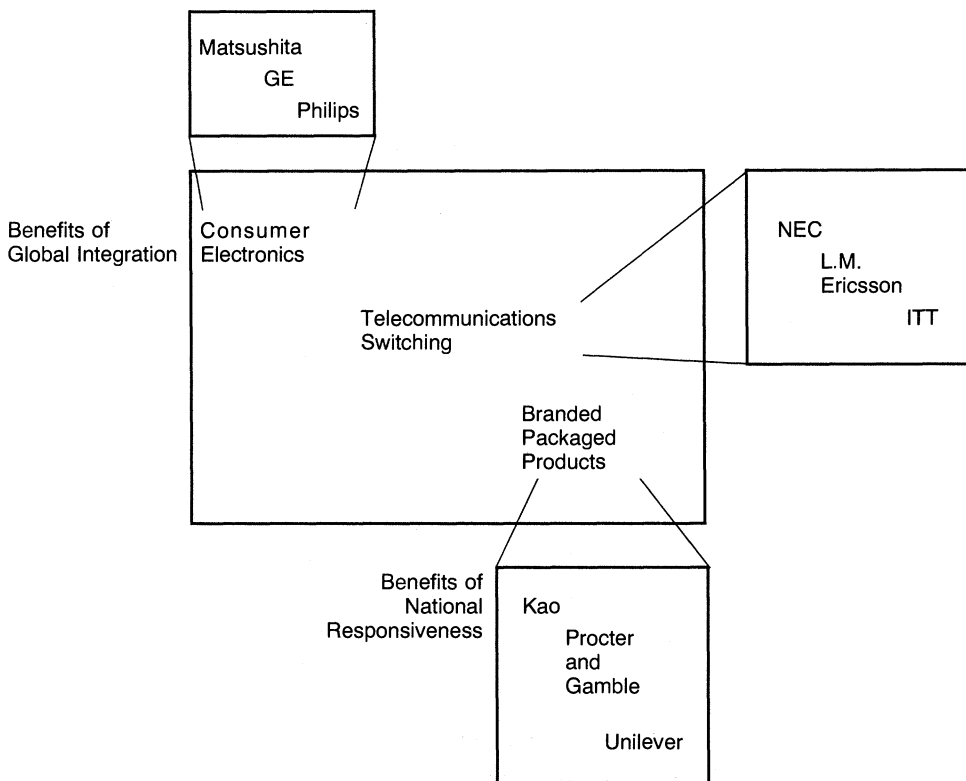
Sample and Data Collection

Given the concept development and hypothesis-generating objectives, our selection of companies for conducting the case studies was based on the logic of sampling for maximum variety [Cook and Campbell 1979]. We chose three industries: consumer electronics, branded packaged products, and telecommunications switching. Each of these businesses was highly international, but represented a very different set of environmental conditions in terms of the strategic needs for global integration and national responsiveness [Prahalad and Doz 1987]. The first offered the greatest benefits of global integration, the forces of national responsiveness were especially strong in the second, and the third represented a situation where both global and local forces were prevalent. Within each industry, we selected a group of companies that represented the greatest variety of administrative heritages [Bartlett 1986] including differences in nationality, internationalization history, and corporate culture. Philips, Matsushita Electric, and General Electric in consumer electronics; Unilever, Kao, and Procter and Gamble in branded packaged products; and L.M. Ericsson, NEC, and ITT in telecommunications switching offered such variety and were chosen as our sample of nine companies.

Figure 2 provides a schematic representation of this sample in terms of the strategic characteristics of the industries and the administrative heritages and competitive postures of the firms. For each box in the figure, the vertical axis represents the strength of globalizing forces in the industry or the extent of global integration in the company's strategic posture, and the horizontal axis represents the need for national responsiveness in the business or the extent of country-by-country differentiation in the company's overall competitive strategy (for a detailed description of the strategic demands of these industries and the administrative heritages and competitive postures of the companies, see Bartlett and Ghoshal [1987]).

We interviewed 184 managers in these companies, both at their corporate headquarters and also in a number of national subsidiaries in the United States, the United Kingdom, Germany, Italy, Japan, Singapore, Taiwan, Australia, and Brazil. Based on these interviews we could document the histories of thirty-eight innovation cases along with some detailed descriptions of the organizational attributes that were associated with each case (see Ghoshal [1986] for a list and brief descriptions of these cases). These thirty-eight innovation cases served as the database for our deriving some propositions on innovation-organization associations in multinational corporations. These propositions have been presented and illustrated in greater detail elsewhere [Ghoshal and Bartlett 1987] and are only briefly summarized below.

Figure 2
Phase I: The Sample of Nine Companies



Propositions

A review of the key characteristics of the participating organizational units for each of the thirty-eight cases of innovations suggested four attributes of a national subsidiary, viz, (1) extent of local slack resources, (2) local autonomy in decision-making, (3) normative integration of the subsidiary with the goals and values of the parent company, and (4) densities of internal communication among managers within the subsidiary and the densities of their communication with managers in the headquarters and other subsidiaries of the company, as the most important in influencing the subsidiary’s ability to carry out the different innovation tasks we have described.

Slack Resources.

In some companies such as Matsushita and Kao, most key organizational assets and resources including R&D, manufacturing and even marketing capabilities were centralized at the headquarters and the national subsidiaries operated with relatively low levels of slack resources. In contrast, national subsidiaries of companies such as ITT and Philips possessed relatively high levels of local resources, including development and manufacturing facilities.² Subsidiaries

of the first group of companies created relatively few innovations — all new products introduced by Matsushita between 1983 and 1986 were developed by the parent company in Japan, for instance — and therefore had few opportunities for diffusion. However, these subsidiaries also appeared to be extremely efficient in adopting and implementing central innovations both quickly and effectively. The subsidiaries of the second group of companies, on the other hand, created a relatively higher number of innovations — different national subsidiaries developed many major products of Philips such as the stereo colour TV set, the teletext TV set, the smart card, and the programmed word processing typewriter — but tended to be more resistant in adopting innovations from the parent company or from other subsidiaries, insisting often on developing their own responses to the problems or opportunities, or at least on significant modifications to others' innovations before adopting them.

These observations are consistent with received theory that suggests the need for slack resources to enable organizations to engage in the search and trial and error activities necessary for creating innovations (for a review, see Bourgeois [1981]). Diffusion, similarly, requires slack since the major benefits of internal diffusion of innovations accrue to the recipients, and diffusing units are not expected to engage in this activity by withdrawing resources that are committed to maintaining their current operational activities. However, local slack may impede adoption because of the Not-Invented-Here (NIH) syndrome [Katz and Allen 1982] and, in the specific context of MNCs, also because local search activities promoted by slack may identify valid reasons why direct adoption of innovations created in other environments is not appropriate [Poynter and White 1984]. Hence the proposition:

PI: High levels of local slack resources will facilitate creation and diffusion but impede adoption of innovations by the subsidiary.

Local Autonomy.

In some of the companies we studied, decisionmaking authority was highly centralized at the headquarters and the national subsidiaries possessed neither the competence nor the legitimacy to initiate any new programs or even to modify any products or processes developed by the parent company. Typically these were companies with highly centralized resources, but even if a subsidiary in such a company came to possess some local slack resources (as did Matsushita's U.S. subsidiary when the company acquired Motorola's television business including its large R&D facility in the U.S.), the application of the resources was controlled from the headquarters. Typically, such subsidiaries with low levels of local autonomy neither created nor diffused innovations, but tended to be effective adopters of new products and processes created by the parent companies. In contrast, subsidiaries of companies like Unilever, ITT, and Philips enjoyed considerable strategic and operational autonomy, though the headquarters exercised varying degrees of administrative control through the budgeting and financial reporting systems. These relatively autonomous subsidiaries created and diffused more innovations but were also comparatively more resistant in adopting innovations created elsewhere.

Existing literature on management of innovations is quite consistent with these patterns we observed in the nine companies. The effects of centralization on innovation has received extensive research attention (see Zaltman et al. [1973] for a review) and empirical findings, though not always consistent [Downs and Mohr 1976], generally show a negative correlation: high levels of centralization impede an organization's ability to create innovations. This is not counter-intuitive since the freedom to experiment is necessary for creating innovations [Mohr 1969]. The negative association between centralization and creation of innovations also implies a negative association between centralization and diffusion since the possibility of diffusion arises only if local innovations are first created. However, the very dependency of the subsidiary on the headquarters facilitates adoption since the subsidiary has neither the authority nor the capability to resist. In the specific domain of research on headquarters-subsubsidiary relations in multinational companies, these arguments find support in the positive correlation between centralization and global product standardization observed by Picard [1977] and Gates and Egelhoff [1986], and the negative correlation between centralization and the extent of local modification of products observed by Picard [1977]. Therefore, considering local autonomy to be the obverse of centralization, we can hypothesize that:

P2: High levels of local autonomy will facilitate creation and diffusion, but impede adoption of innovations by the subsidiary.

Normative Integration.

We found considerable evidence of positive associations between creation, adoption, and diffusion of innovations by a subsidiary and the extent to which the subsidiary was normatively integrated with the parent company and shared its overall strategy, goals and values. Such integration was typically the result of a high degree of organizational socialization and was achieved through extensive travel and transfer of managers between the headquarters and the subsidiary, and through joint-work in teams, task forces, and committees. A typical illustration of such normative integration was the "ization" program of Unilever — a systematic effort to "Unileverize" the company's operations in different countries as well as to "internationalize" Unilever management worldwide — that was supported by an elaborate and planned system of executive transfers, management development programmes, and regular meetings and conferences. Managers of the company strongly believed that these investments had helped in developing a common context that had significantly improved subsidiary contributions to the company's innovation processes. Similar experiences were also reported by companies as diverse as Ericsson, Procter and Gamble, and NEC.

Received theory suggests that for any organization to engage in the act of creating innovations, two sets of conditions must be met: the act must be feasible, and it must be desirable [Mohr 1969]. For national subsidiaries of a multinational company, local resources and autonomy are necessary to meet the condition of feasibility, and normative integration is necessary to meet the condition of desirability [Baliga and Jaeger 1984; Jaeger 1983]. Existence of

inclusive goals and shared values facilitates creation of innovation not only by motivating subsidiaries to be entrepreneurial [Kanter 1983], but also by enhancing the headquarter's responsiveness to subsidiary needs and appreciation of subsidiary initiatives. Similarly, by de-emphasizing turf issues, shared objectives help in moderating the normal hierarchy of managerial loyalties whereby local interests tend to be allocated higher priorities than global interests. In other words, the organizational context that is created by normative integration facilitates both the adoption and diffusion tasks. Therefore, it can be hypothesized that:

- P3:* High levels of normative integration between the headquarters and the subsidiary will facilitate creation, adoption, and diffusion of innovations by the subsidiary.

Intra- and Inter-unit Communication.

Almost without exception, we found that national subsidiaries that created relatively higher numbers of innovations were also those that had relatively higher densities of internal communication among their different managers. Most of these subsidiaries, such as those of Philips in the U.K. and in Brazil, had many formal and informal mechanisms such as cross-functional teams, ad hoc as well as more durable committees at multiple levels of management, and multidisciplinary task forces to facilitate and enhance internal communication among different departmental managers.

Most of the adoption cases we came across pertained to innovations that were created in the headquarters. Cases of diffusion of an innovation by one subsidiary to another were relatively few. Subsidiaries that were especially effective at adopting parent company innovations were typically those that, like the U.S. subsidiary of Matsushita, had manifestly dense communication between local managers and managers at the headquarters. Most departmental managers in these subsidiaries communicated with one or more headquarters managers on a daily basis, over telex or telephone, and also through regular travel, usually of headquarters managers to the subsidiaries. In the few cases of adoption by one subsidiary of an innovation diffused by another, the two subsidiaries (such as Philips' subsidiaries in Germany and the U.K.) tended to be linked through fairly regular communication that was maintained either because of strong personal relationships or the dependence of one on the other for final or intermediate products.

These observed associations between creation, adoption, and diffusion of innovations by MNC subsidiaries and the densities of their intra- and inter-unit communication are not counter-intuitive. Communication patterns reflect the nature and extent of organizational integration, and integration is a key determinant of organizational innovation [Lorsch and Lawrence 1965]. The importance of intra-unit communication for creation of innovations has been demonstrated qualitatively by authors such as Burns and Stalker [1961] and Kanter [1983] and more quantitatively by Allen and his associates [Allen 1977; Allen and Cohen 1969; Allen, Lee and Tushman 1980]. A relatively straightforward extension of the arguments presented by these authors will

suggest that an MNC subsidiary's adoption of central innovations will, for the same reasons, be facilitated if headquarters–subsidiary communication is intense, and its ability to both diffuse its innovations to other subsidiaries and to adopt innovations from them will depend on the extent of communication that exists among the subsidiaries. Therefore,

P4: Creation of innovations by a subsidiary will be facilitated by high levels of intra–subsidiary communication, and both adoption and diffusion by high levels of headquarters–subsidiary and inter–subsidiary communication.

PHASE II: QUESTIONNAIRE SURVEYS IN THREE COMPANIES

Sample and Data Collection

Data for the second phase of the study were collected through a multiple-indicator, multi–respondent, mailed questionnaire survey of headquarters and subsidiary managers involved in a single business in each of three of the nine companies that were studied in the first phase, viz., the consumer electronics business of Philips, the consumer electronics business of Matsushita Electric, and the telecommunications switching business of NEC. This was a purely convenience sample, these being the only three of the nine companies that agreed to host the survey.

Ten wholly owned subsidiaries each of Philips and Matsushita and five of NEC (which had relatively fewer wholly owned national operations) were included in the survey. The subsidiaries were selected in consultation with corporate managers of the companies and represented a wide variety in terms of size, activities that were undertaken locally, and characteristics of host country environments (for descriptions, see Ghoshal [1986]). In each of these subsidiaries, questionnaires were mailed to all departmental managers based on lists and organization charts furnished by the companies.

The data analysis procedure adopted by us required aggregation of the responses of all managers from a particular subsidiary to arrive at subsidiary-level scores for each variable. However, for such aggregation to be valid, it was necessary to have usable responses from *each and every* departmental manager of the subsidiary. For example, subsidiary level scores for the number of innovations created locally could not be computed unless the number of innovations created by each department was known. Similarly, our earlier case research had made it quite clear that within a subsidiary, the relationships with the headquarters could be very different for different functions and unless responses for all functional managers were included in the aggregation process, subsidiary-level measures for variables such as autonomy or communication would not be comparable. Therefore, in the analysis we included only those subsidiaries from which we had received responses from every departmental manager. Eight subsidiaries of Matsushita (fifty-six respondents), seven of Philips (fifty-two respondents), and all five of NEC (thirty-three respondents) met this

condition and data obtained from managers of these subsidiaries constitute the primary database for this report³.

For some of the variables such as creation, adoption, and diffusion of innovations, comparable data could be obtained from these subsidiary-level respondents. However, for some other variables such as slack resources, local autonomy, or normative integration, responses from subsidiary managers could suffer from different perceptual anchors and these measures required some check for reliability and comparability. This was done by obtaining comparative estimates of these variables also from some corporate-level respondents. The procedure and results of these reliability tests are presented later in this section.

Variables and Measures

All respondents were asked to enumerate and also *describe* the innovations that were created, adopted, and diffused by their departments within the preceding twelve months.⁴ The final measure for each indicator was based on evaluation of these descriptions and some cases included by the respondents were excluded by us since they did not qualify to be called innovations (e.g., “instituted a system for recording employee attendance”). In some instances, additional information was sought from the respondents and also from the subsidiary general managers to decide if the cases should be included in the final count. As indicated above, subsidiary-level scores for each of these variables were arrived at by simply adding the total number of innovations created, adopted, and diffused by the different departments of the subsidiary.

Each respondent was requested to report the frequency of his or her communication with managers of other departments in the same subsidiary and with managers in the headquarters and other subsidiaries of the company. The instrument developed by Allen [1977] was used and data was collected in five categories that varied from daily communication to communication less than once a year. However, only daily, weekly, and monthly communication were scored as 3, 2, and 1, respectively, and communication with lower frequencies were ignored. Based on this scoring system, “internal,” “headquarters,” and “other subsidiary,” communication densities were computed for each respondent as the average frequency of his or her communication with other managers within the subsidiary, with managers in the headquarters, and with managers in other subsidiaries, respectively. For each of these variables, the density scores of all the managers from the subsidiary were then aggregated to arrive at a subsidiary-level measure.

To avoid normative bias and as an alternative to purely perceptual and subjective measures of normative integration, we adopted as its indicators measures of the socialization mechanisms that both received theory [Schein 1968; Van Mannen and Schein 1979] and our own case studies suggested as its causes.⁵ Three indicators were chosen. Given the well-documented role of executive transfers as a key mechanism for promoting shared goals and values in MNCs [Edstrom and Galbraith 1977], our first indicator was the amount of time the

subsidiary 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 others were assigned a score of zero. The second indicator, justified primarily on the basis of our own case research [Bartlett and Ghoshal, forthcoming], was the existence of a mentor at the headquarters, scored as one if the manager reported having such a person, and zero otherwise. The third indicator was based on the number of trips the manager made to the headquarters (see Young, Hood and Hamill [1985], for both theoretical arguments and empirical evidence on the role of executive travel in developing cultural integration in multinational companies). Managers who visited the headquarters at least once 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 normative integration for each respondent; the scores of all respondents from the subsidiary were then aggregated to provide a subsidiary-level measure for the variable.

The level of local autonomy was measured by estimating, on scales of 1 (low) to 5 (high), the relative influence of the subsidiary on six types of decisions, viz., (1) introduction of a new product, (2) minor but significant modification of an existing product, (3) modification of a production process, (4) restructuring of the subsidiary organization involving creation or abolition of departments, (5) recruitment and promotion to positions just below that of the subsidiary general manager, and (6) career development plans for departmental managers (these decision situations were adopted from the instrument developed and used by De Bodinat [1975]). The average scores for all these decisions for all the respondents from the subsidiary were aggregated to yield a subsidiary-level measure for local autonomy.⁶

Finally, the level of slack resources was estimated by requesting the respondents to furnish, on a scale of 1 (significant disruption of activities) to 5 (no perceptible effect), the consequence of a 10% reduction in the operating budgets of their departments. These responses were similarly aggregated for all respondents from a subsidiary to compute a subsidiary-level measure for slack.

Reliability Test through Corporate-Level Respondents

In each company, we identified two senior managers at the headquarters who had direct line responsibilities for all subsidiaries of the company that were included in the survey, or were otherwise knowledgeable about the operations of those subsidiaries. These managers were requested to rate, on scales of 1 (low) to 5 (high), each of these subsidiaries on the following attributes: extent to which the subsidiary could expand its operations without significant additional resources (slack resources), level of subsidiary influence on deciding its own strategy and tactics (local autonomy), and extent to which subsidiary managers shared the parent company's goals and values (normative integration). As indicated earlier, these direct and single-indicator measures were obtained to test the reliability of the indirect and multiple-indicator measures that were

TABLE 1
Spearman's Rank Correlations for Assessing Inter-Rator Convergence
on Selected Variables

	HQ-HQ Rators			HQ-Subsidiary Rators		
	Matsushita	Philips	NEC	Matsushita	Philips	NEC
Slack Resources	0.79	0.84	0.76	0.84	0.53	0.77
Local Autonomy	0.71	0.69	0.86	0.95	0.70	0.75
Normative Integration	0.62	0.59	0.43	0.60	0.75	0.70

obtained from the subsidiaries for each of these variables. Comparison of the responses obtained from the headquarters and the subsidiary-level respondents revealed the following:

- In all three companies, inter-rator convergence was high for the two headquarters respondents. For each variable, the ranks of the different subsidiaries were assessed similarly by both as shown in the rank correlations in Table 1.
- For each of the three variables that were estimated by the headquarters-level respondents, Table 1 also shows the correlations among the ranks of subsidiaries obtained by aggregation of responses from the subsidiary and the headquarters managers. As can be observed readily, in each company, inter-rator convergence was high among headquarters and subsidiary-level respondents.

Given such convergence, only the responses from subsidiary managers were used for further analysis.

Innovation-Organization Associations

For each company, we computed the ranks of each subsidiary for all the measured variables. Subsidiary ranks for creation, adoption, and diffusion of innovations were then compared with the ranks for the different organizational attributes. Results of these comparisons are shown in the Spearman's rank correlations in Table 2. The rank correlation approach was adopted to avoid excessive influence of outliers. The findings, however, remain unaltered even if the absolute measures are considered and Pearson's correlation coefficients are employed.

Given the small number of subsidiaries in each company, the statistical significance or otherwise of these rank correlation coefficients should not be overemphasized. Further, the same constraint of sample size prevented analysis of partial correlations and the zero-order correlations could be influenced significantly by interaction effects. However, we have indicated in the table the significance levels (one-tailed test) for each of the correlation coefficients based on Olds' [1938] method for estimating the significance of rank correlations for small samples when variables are not assumed to be distributed normally. Comparison of these correlation coefficients with the propositions lead to the following conclusions.

TABLE 2
Spearman's Rank Correlations between Creation, Adoption, and Diffusion of Innovations and the Different Organizational Attributes

Organizational Attributes	Matsushita Electric			N.V. Philips			NEC Corporation		
	Creation	Adoption	Diffusion	Creation	Adoption	Diffusion	Creation	Adoption	Diffusion
1. Slack resources	0.66	0.71*	0.85***	0.96***	0.73**	0.78**	0.89*	0.58	0.66
2. Local autonomy	0.52	0.17	-0.22	0.89***	0.83**	0.65	0.48	0.63	0.71
3. Normative integration	0.67*	0.71*	0.67*	0.86**	0.79**	0.91***	0.89*	0.94*	0.86
4. Intra-Sub. communication	0.76*	0.86***	0.70*	0.85**	0.55	0.81**	0.90*	0.71	0.77
5. HQ-Sub. communication	0.61	0.83***	0.69*	0.68	0.79**	0.87**	0.71	0.90*	0.93*
6. Inter-Sub. communication	0.56	0.80**	0.91***	0.61	0.81**	0.86**	0.43	0.69	1.00*

Note: Significance of α for one-tailed test indicated by * ($\alpha < 0.05$), ** ($\alpha < 0.025$), and *** ($\alpha < 0.01$), based on Table 11 in Olds (1983).

First, some of the proposed associations are supported by the data. This is particularly true with regard to the hypothesized effects of normative integration and communication on creation, adoption, and diffusion of innovations by MNC subsidiaries. In all three companies, normative integration is positively and significantly correlated with creation and adoption of innovations. Similarly, the relationships between intra- and inter-unit communication and creation, adoption, and diffusion of innovations are all significant in the right direction.

Second, some of the proposed associations are not confirmed. The hypothesized effects of local autonomy, in particular, find no support in any of the companies. There is no evidence that local autonomy facilitates creation and diffusion of innovations, or that it impedes adoption.

Finally, results on the effects of local slack resources are mixed. There is some evidence that slack facilitates creation and diffusion (correlations significant in two out of three companies), but its hypothesized effect on adoption is rejected. Contrary to our hypotheses, the association between slack and adoption is not negative in any of the three companies.

Three Categories of Subsidiaries

In both Matsushita and Philips, some subsidiaries were found to only create innovations but not adopt or diffuse any (group 1), some others created and adopted innovations but did not diffuse (group 2), and only a few subsidiaries engaged simultaneously in all three tasks of creation, adoption, and diffusion as we have defined them in this paper (group 3). In NEC (perhaps because of the smaller number of subsidiaries that were considered) we observed only the second two groups: subsidiaries that created and adopted innovations but did not diffuse, and subsidiaries that did all three. Further, in all three companies, subsidiaries that engaged in all three activities (group 3) were also the ones that recorded the highest scores in all three tasks.

Table 3 shows the numbers of innovations created, adopted and diffused by the eight subsidiaries of Matsushita, and also their scores for the different organizational attributes. E and F are group 1 subsidiaries; G and H belong to group 2; and subsidiaries A, B, C, and D belong to group 3.

The different organizational attributes of Matsushita subsidiaries belonging to the different groups are compared in Table 4. The table shows, for each group, the mean levels of local slack resources, local autonomy, normative integration, and the densities of intra-subsidiary, headquarters-subsidiary, and inter-subsidiary communication. Results of one-way ANOVA tests revealed significant (F -statistic significant at the 0.01 level) differences among subsidiaries in the three groups for all organizational attributes except for inter-subsidiary communication.

Further investigation of the pair-wise differences among the three groups (Scheffe's test) showed the following:

1. Subsidiaries in group 1 had significantly higher levels of local autonomy and significantly lower levels of slack resources, normative

TABLE 3
Creation, Adoption and Diffusion of Innovations by Subsidiaries of Matsushita Electric

Subsidiary	Number of Innovations		Slack Resources (scale 1-5)	Local Autonomy (scale 1-5)	Normative Integration (scale 1-3)	Communication Density (Scale 1-3)		
	Created	Adopted				Diffused	Intra-Subsidiary	HQ-Subsidiary
A	20	3	3.9	3.4	2.1	1.9	1.4	0.0
B	16	8	4.3	3.2	2.6	1.6	1.4	0.1
C	17	6	5.0	3.5	1.9	1.9	1.5	0.3
D	22	12	4.1	4.2	1.7	2.2	1.8	0.4
E	14	0	2.2	4.5	0.7	0.8	0.1	0.0
F	11	0	3.4	3.7	0.6	1.1	0.7	0.0
G	8	2	3.2	3.0	1.1	1.3	1.6	0.1
H	7	4	2.8	2.9	0.8	1.4	1.5	0.0

TABLE 4
Organizational Attributes of Subsidiaries Belonging to the Three Groups: Matsushita Electric

	Mean Values			F-statistic	Scheffe's Test (pairs that are not significantly different)
	Group 1	Group 2	Group 3		
Slack Resources	2.8	3.0	4.3	8.3*	(1,2)
Local Autonomy	4.1	2.9	3.6	14.9*	none
Normative Integration	0.6	1.0	2.1	17.6*	none
Intra-subsi- dary communication	1.0	1.3	1.9	11.6*	none
HQ-subsi- dary communication	0.4	1.5	1.5	8.4*	(2,3)
Inter-subsi- dary communication	0.0	0.0	0.2	1.9	all

Note: * indicates significance at 0.01 level.

integration, intra-subsi-
dary communication, and headquarter-
subsi-
dary communication compared to subsidiaries in the other
two groups.

2. Subsidiaries in group 2 had significantly lower levels of local autonomy compared to subsidiaries in the other two categories.
3. Subsidiaries in group 3 had significantly higher levels of local resources, normative integration, and intra-subsi-
dary communication compared to subsidiaries in the other two groups.

Exactly identical patterns were observed in Philips, two subsidiaries each of which could be categorised in groups 1 and 2; and three in group 3. Group 1 subsidiaries had the highest levels of local autonomy, but the lowest levels of normative integration and intra-subsi-
dary as well as headquarter-
subsi-
dary communication. Group 2 had the lowest levels of local autonomy. Group 3 subsidiaries had the highest levels of normative integration, as well as the most dense communication, both within the subsidiary and also with the headquarters. In the case of NEC, three subsidiaries belonged to group 2 and the remaining two to group 3. Here again, the key differentiating factors were the higher levels of normative integration, local autonomy, and internal and headquarter-
subsi-
dary communication in the group 3 subsidiaries. To save space, we do not report the data for these two companies here, but interested readers can find them in Ghoshal [1986].

In a normative sense, group 3 subsidiaries have the most desirable innovation characteristics: not only do they engage in all three tasks of creating, adopting, and diffusing innovation, but also record the highest scores in each task. In all three companies, these subsidiaries were differentiated from the others by higher scores on normative integration and higher densities of intra- and inter-unit communication.

PHASE III: LARGE SAMPLE SURVEY OF U.S. AND EUROPEAN MNCs

Sample and Data Collection

In the third phase of the study, we mailed a questionnaire to the chairman or CEO of all the 438 North American and European MNCs listed in Stopford's [1983] *World Directory of Multinational Enterprises*. We did not receive any response from 215 companies while another 50 wrote to us declining participation on different grounds. 31 questionnaires were returned due to wrong mailing addresses and completed questionnaires were received from the remaining 76 companies. Of these, 66 were complete in all respects and were used for the statistical analysis reported below. In 50 of these 66 companies, the respondent was the corporate vice-president responsible for all international operations or someone with even greater responsibility such as the CEO or the chairman. While the response rate was modest, the respondents were distributed across geographical boundaries and industries in a manner quite similar to that of the relevant population and no discernable pattern could be found among the non-respondents (for more detailed analysis of sample, response patterns, non-response bias, and measurement procedure, see Ghoshal and Nohria [1987]). 36 of the 66 companies were headquartered in North America and the remaining 30 were headquartered in Europe. Four had annual sales below \$1 billion and 11 had annual sales above \$10 billion; the remainder were within this range. Collectively, these 66 companies reported data on 618 national subsidiaries — 5 companies had less than 5 subsidiaries, 44 had between 5 and 15 subsidiaries, and 12 had more than 15 subsidiaries. A wide range of industries were represented by these companies including aerospace (2 companies), building products (3), chemicals (7), food and drinks (7), electrical and electronics (3), health care (3), industrial equipments (9), metals (11), motor vehicles (3), office equipment (2), paper and wood products (2), petroleum products (7), rubber (2), textiles (2), and others (3).

Variables and Measures

The questionnaire used for this survey was the same as was used for the corporate-level survey in the second phase with only the addition of two new variables. It required the CEO of the company or some other manager who was responsible for overall assessment of the company's international operations to rate, on scales of 1 (low) to 5 (high), each of the company's foreign subsidiaries on its ability to create and adopt innovations, and also on its local resources, local autonomy, shared goals and values with the parent company, and intensity of communication with the headquarters. Our objective was primarily to measure differences among the subsidiaries within an MNC. As such, measures were sought not relative to some absolute anchor that was invariable across all MNCs, but relative to an internal anchor that represented the average level of the particular variable for the firm.

It is important to highlight that all measures represent perceptions of a senior manager in the headquarters for all the subsidiaries of the company. The issue

TABLE 5
Zero-order Correlation Matrix

1. Local resources	0.63	*			
2. Local autonomy	0.54	*	0.51		
3. Normative Integration	0.37	0.15	0.45	0.20	
4. Headquarters–subsidiary communication	0.23	0.21	0.39	*	0.32
	Creation of innovations	Adoption of innovations	Local resources	Local autonomy	Normative Integration

Note: All correlations significant at 0'001 level except those marked*.

of objective versus perceptual measures has been the topic of an ongoing debate in the literature [Downey and Ireland 1979] and perceptual measures from a single key informant can clearly suffer from some deficiencies. Our justification for using this measurement system was based on two grounds. First, the close correspondence in the findings from the single–indicator, perceptual measures obtained from corporate-level respondents and the multiple–indicator objective and perceptual measures obtained from subsidiary managers in the second phase of the study provided some support to the reliability and validity of the first measurement system. Second, collecting objective level measures for the relatively large number of variables from a large enough number of subsidiaries for meaningful statistical analysis presented enormous and, for us, insurmountable practical problems. However, because of this measurement system, we could not measure three variables of interest, viz., the subsidiary's ability to diffuse innovations, the density of its internal communication, and the densities of its communication with other subsidiaries. It was felt that headquarters managers could have little basis to make reliable estimates for these variables.⁷

Innovation — Organization Associations

Table 5 shows the correlations between the subsidiary scores on creation and adoption of innovations and their scores on local resources, local autonomy, normative integration, and headquarters–subsidiary communication. Only correlations that are significant at the 0.001 level have been included and significant inter–correlations (at the same 0.001 level) among all these variables are also presented in the table.

The high inter–correlations among the variables restrict the inferences that can be drawn from these zero–order correlation coefficients. However, it may be noted that creation of innovation by the subsidiary is very highly correlated with both local resources and local autonomy, while adoption is not significantly correlated with either of these two variables. Normative integration and headquarters–subsidiary communication, on the other hand, have significant positive correlations with both creation and adoption of innovations.

To develop a better understanding of these innovation–organization associations, a second analysis was undertaken to look for differences between high and

TABLE 6
Distinguishing Attributes of Subsidiaries Scoring High, Medium and Low on Creation of Innovations

Subsidiary Attributes (all measured on scales of 1 (low) to 5 (high))	Creation of Innovations by the Subsidiary			"F" Statistic	"F" Probability	Is high-low pair distinguished at the 0.05 level? (Scheffe's Test)
	High	Medium	Low			
1. Local resources	4.3	3.2	1.9	97.5	0.0000	Yes
2. Local autonomy	3.0	2.2	1.2	75.0	0.0000	Yes
3. Normative integration	4.2	3.5	2.9	28.9	0.0000	Yes
4. Intensity of headquarters-sub subsidiary communication	3.5	3.2	2.7	19.6	0.0001	Yes

low-performing subsidiaries on both creation and adoption of innovations. The creation and adoption scores were first normalized for all subsidiaries of the same company and these normalized scores (*z*-scores) were divided into three categories of high ($z > 1$), medium ($1 > z > -1$), and low ($z < -1$).

Table 6 shows the mean values of the different organizational attributes for subsidiaries scoring high, medium, and low on creation of innovations. The "F" probabilities indicate whether the differences among the categories are statistically significant. The Scheffe's test results indicate whether the differences between the high and low scoring groups are statistically significant. This analysis reinforces the findings from the correlation analysis: subsidiaries with higher scores on creation of innovations have significantly higher levels of local resources, local autonomy, normative integration, and communication with the headquarters compared to other subsidiaries of the company.

Table 7 shows the results of the same analysis for subsidiaries scoring high, medium, and low on adoption of innovations. As was suggested by the correlation analysis, local resources and autonomy do not discriminate among the different categories of subsidiaries, while normative integration and headquarters-sub subsidiary communication do.

Finally, to analyze the joint effects of the different organizational attributes on a subsidiary's ability to create and adopt innovations, a stepwise regression analysis was undertaken. The results of this analysis are shown in Table 8

TABLE 7
Distinguishing Attributes of Subsidiaries Scoring High, Medium, and Low on Adoption of Innovations

Subsidiary Attributes (all measured on scales of 1 (low) to 5 (high))	Adoption of Innovations by the Subsidiary			"F" Statistic	"F" Probability	Is high-low pair distinguished at the 0.05 level? (Scheffe's Test)
	High	Medium	Low			
1. Local resources	3.3	3.1	3.0	1.3	0.2713	no
2. Local autonomy	2.2	2.1	2.3	3.2	0.0428	no
3. Normative integration	3.7	3.5	3.2	6.5	0.0016	yes
4. Intensity of headquarters-sub subsidiary communication	3.5	3.2	3.0	11.6	0.0001	yes

TABLE 8
Regression Results

Dependent variable	Influencing variables					Adj R^2
	Local resources	Local autonomy	Normative Integration	Headquarters-subsidary communication	F-statistic (significance)	
1. Creation of innovations by the subsidiary	0.43 (11.69)	0.30 (9.06)	0.12 (3.70)	0.10 (2.41)	187.7 (0.000)	0.52
2. Adoption of innovations by the subsidiary	—	—	0.21 (5.76)	0.19 (4.62)	20.22 (0.000)	0.09

Note: The values in the table are the beta coefficients under which the t -statistics are shown in brackets. Coefficients not significant at 0.05 level are not shown.

(the right-hand side variables are listed in the order in which they entered the equation). Given the high correlations among the influencing variables, the beta coefficients cannot be interpreted unambiguously. We present the results, however, only to highlight that the four variables, viz., local resources, local autonomy, normative integration, and headquarters communication, collectively explain 52% of the total variance in the subsidiary scores on creation of innovation. Variance in adoption scores, on the other hand, cannot be explained to any significant extent by these variables, though both normative integration and headquarters-subsidary communication appear to have statistically significant impacts.

CONCLUSIONS

Our objective in adopting the relatively complex multiphased and multi-methodology research design was to achieve some of the benefits of what Harrigan [1983] described as the hybrid methodology by triangulating multiple research approaches and comparing the results from each approach. Each of the methodologies we adopted suffered from many limitations, some of which were inherent in the methodology itself, and some others were imposed by flawed application due to the practical problems we faced in its implementation in the specific context of our study. Our hope, however, was that some of the findings would be robust enough to be confirmed by each methodology and those findings would constitute our conclusions from the study.

In Table 9 we summarize the associations we found in the different phases of the study between creation, adoption, and diffusion of innovations by subsidiaries of multinational companies and the four organizational attributes of the subsidiaries that we had focused on based on the findings of the initial case studies. The similarities and differences in the findings lead to the following conclusions.

First, the effects of normative integration and intra- and inter-unit communication appear to be positive for all the three innovation tasks, and this finding is consistent across the three methodologies. The importance of socialization and communication for promoting innovations in complex organizations has been

TABLE 9
Comparison of Findings from the Different Methodologies

	Case research in nine companies (Phase I)	Multiple-indicator, multiple-level, multiple-respondent survey in three companies (Phase II)	Single-indicator, single-respondent, headquarters-level survey in 66 companies (Phase III)
Associations between CREATION of innovations by the subsidiary and			
– Local resources	+	+	+
– Local autonomy	+	0	+
– Normative integration	+	+	+
– Headquarters-subsidiary communication	0	+	+
– Intra-subsidiary communication	+	+	not measured
– Inter-subsidiary communication	0	0	not measured
Associations between ADOPTION of innovations by the subsidiary and			
– Local resources	–	+	0
– Local autonomy	–	0	0
– Normative Integration	+	+	+
– Headquarters-subsidiary communication	+	+	+
– Intra-subsidiary communication	0	+	not measured
– Inter-subsidiary communication	+	+	not measured
Associations between DIFFUSION by innovations by the subsidiary and			
– Local resources	+	+	not measured
– Local autonomy	+	0	not measured
– Normative Integration	+	+	not measured
– Headquarters-subsidiary communication	+	+	not measured
– Intra-subsidiary communication	0	+	not measured
– Inter-subsidiary communication	+	+	not measured

Note; Symbols in the table indicate positive (+), negative (–), or insignificant (0) associations.

highlighted by many authors (e.g., Burns and Stalker [1961]), most recently and most compellingly by Kanter [1983]. Thus, this conclusion is not new to organizational theory on innovations, except that we have provided some additional empirical support to the theory in the specific context of one kind of multi-unit complex organizations, viz., multinational corporations.

The findings, however, are not as consistent or unambiguous with regard to the effects of local resources and autonomy. It appears that local resources tend to facilitate creation and diffusion of innovations, but its effect on adoption is inconclusive. For local autonomy, the inconsistencies in the findings across

the different methodologies are even more severe. These inconsistencies can be explained, however, if we assume that the influences of these organizational attributes on the different innovation tasks are mediated by the level of normative integration in the organization that is achieved by socialization of members and communication within and among different parts. The relationship between the headquarters of a multinational and each of its different national subsidiaries essentially represents a situation of mixed motives [Schmidt and Kochan 1977] wherein each party may have both convergent and conflicting interests and perspectives.⁸ High levels of normative integration and information exchange can enhance the salience of the convergent interests and, in this situation, local resources and autonomy may lead to more vigorous participation of the subsidiary in the tasks of creating, adopting, and diffusing innovations that benefit the company as a whole [Edstrom and Galbraith 1977; Galbraith and Edstrom 1976]. In the absence of such integration, however, the conflicting interests may become relatively more salient in which case the effects of local resources and autonomy may either be negligible or even negative. The specific differences among the three groups of subsidiaries that were found in the second phase of the study (Tables 3 and 4) provide some support to this speculation. However, to consider such direct as well as indirect effects of the different organizational attributes and to incorporate in the analysis the inter-relationships that exist among these attributes, a more formal model-building and testing approach is necessary and this is the direction that we plan to take in our own future research on this topic.

NOTES

1. There can be a fourth task, that of 'participation' in global innovations that are created jointly by the headquarters and a number of national subsidiaries of the MNC. In this paper, we do not consider this task since it can vary widely in both nature and extent and cannot, therefore, be precisely defined or measured. However, our case-research suggests that subsidiaries that are effective simultaneously in all three tasks of creation, adoption, and diffusion, are also effective in the task of participation. See Ghoshal and Bartlett [1987] for illustrations of such global innovations and descriptions of the organizational attributes that facilitate such innovations in MNCs.

2. We faced considerable difficulties in differentiating between resources and slack resources. Theoretically, slack is represented by resources in excess of those that are required for maintaining current activities. In practice, however, it is extremely difficult to distinguish resources that are necessary and those that are in excess. In the first phase of the study, therefore, we could not differentiate between the two and used factors such as availability of local R&D and manufacturing facilities, the existence and size of staff departments such as planning, organization development, and efficiency improvement, and managers' perceptions regarding their ability to fund projects on discretionary bases, as indicators of slack resources. In the second and third phases of the study, however, we requested the headquarters managers to provide, for each subsidiary of the company, comparative estimates of resources, and also of the levels of additional activities that could be undertaken by the subsidiary without any additional resources — the second measure being a proxy for slack. The estimates of resources and slack so obtained were found to be highly correlated in all the cases (see Ghoshal [1986]). This empirical finding was also entirely consistent with the resource dependency perspective in organization theory [Pfeffer and Salancik 1978] which would predict the resources available to a subunit to significantly influence the subunit's ability to generate slack. The results of the second and third surveys that are presented in following sections are based on the measures of slack resources which we believe to be theoretically the more appropriate concept for our present purposes.

3. We mailed a total number of 82, 74, and 34 questionnaires to the different subsidiaries of Philips, Matsushita, and NEC, respectively. Seventy-one (87%), 69 (93%), and 33 (97%) filled responses were received from each, and 52 (63%), 56 (76%), and 33 (97%) responses could be used, given this criteria.
4. The term "innovation" was defined in the questionnaire as any product, manufacturing process, or administrative system that was new for the subsidiary. The issue of "new for whom?" has been debated extensively in the literature on definition of innovations and, given the objectives of our study, we sided with those who have argued that anything new to the adopting unit qualifies as an innovation, even if it is not new to the world as such. For an extensive discussion on this issue, see Zaltman et al. [1973].
5. In the headquarters-level survey to be described later in this section, the corporate managers were asked to rate directly the extents to which each of the subsidiaries shared the parent's goals and values. The high rank correlations between the subsidiary ranks calculated on the basis of the headquarters and subsidiary-level responses (see Table 1) provide some support for this indirect system of measuring this variable at the subsidiary level.
6. Following the suggestions of De Bodinat, we had differentiated between local autonomy for strategic and operational decisions, and had measured the former on the basis of relative influence exercised on (1) introduction of a new product, (2) modification of production process, and (3) restructuring of the subsidiary organization involving creation or abolition of departments, and the latter on the basis of relative influence exercised on the other three decision situations. However, the measures of strategic and operational autonomy so obtained were highly correlated for all three companies (see Ghoshal [1986]). Therefore, this distinction was dropped and a single measure of autonomy was adopted.
7. We had pre-tested the headquarters-level questionnaire with ten senior managers who were participating in an executive education program at MIT's Sloan School of Management. Each of these managers had considerable experience of working at the headquarters of large multinational companies and the collective opinion of the group was that corporate managers could not have any reliable basis to estimate these attributes for the company's different national operations. Similar views were also expressed by some corporate managers of Philips, NEC, and Matsushita when we consulted them regarding the designs of the different questionnaires.
8. This idea came from Nitin Nohria and has been developed further in Ghoshal and Nohria [1987].

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