

INTERNAL AND EXTERNAL LINKAGES IN THE MNC:
THE CASE OF R&D SUBSIDIARIES IN JAPAN

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The challenge of strengthening, diversifying, and exploiting the cross-border linkages within the multinational corporation has recently emerged as one of the dominant themes in the field of international business. Competitive pressures are driving MNC managers to seek to increase cross-border coordination in order to exploit potential economies of scale and locational advantages and to realize potential scope advantages by applying innovations and knowhow generated in one subunit elsewhere in the organization¹. And in a dynamic context, where existing products and processes are being modified and new products introduced, cross-border coordination requires increasingly dense cross-border interaction. The emphasis on cross-border coordination extends to the arena of linkages with other firms, as the longstanding resort to local joint ventures with single-country partners is being overshadowed by global strategic alliances with other MNCs.²

The increasing density of cross-border linkages within the MNC generates increasing pressure toward convergence in the organizational patterns of headquarters and the various subunits in an array of countries.³ Some of this convergence is the result of deliberate design, as it is in MNCs that have moved to global product organizations that reach into subsidiaries to realign their organizations more closely with that of headquarters. Even more is the unanticipated consequence of the growing reliance on socialization -- on shared conceptual maps and ongoing interactions -- as a control strategy.⁴

Yet the pressures for convergence contend with pulls toward variation. As the extensive literature on MNCs emphasizes, subsidiaries in different countries are subject to different national regulatory regimes and embedded in different

national cultures; they each bear a different legacy from their historical development over time; and they have varying strategic mandates depending both on that history and on the resource environments of their respective societies. In addition, they are located in varying sets of external linkages to other organizations within their own society.

Therefore the focus on managing the internal linkages of the MNC must be complemented by awareness of the potential constraints on the effective operation of those linkages from the the organizational variation among subsidiaries and from the external networks in which each subsidiary is embedded. This includes an understanding of the potential effect of organizational changes on the subsidiary and its networks. If, for example, a subsidiary in Brazil has followed the organizational patterns and human resource development systems of local Brazilian firms, will significant changes become necessary as its level of coordination with European subsidiaries and with its North American parent increases? If these changes are made, making it more similar to the patterns in those other subunits, will that have negative effects on its capacity to function effectively in Brazil? And if new patterns are modelled on those developed in the social context of another country, how can their inevitable adaptation to their new organizational and social environment be anticipated and planned for? The MNC dilemma of reconciling the benefits of the local tailoring with those of global standardization in products and in strategies has been joined by the organizational dilemma of local vs. standardized organizational patterns. And in this dilemma, finding ways of combining variation and standardization is even more complex than in the arenas of products and strategies.

This paper explores the sources and implications for organization design of the potentially competing pressures toward convergence and divergence within

the MNC in the context of one function, R&D, and in one society, Japan. A growing number of American and European MNCs have recently decided to establish R&D laboratories in that country, both to adapt their products to the demands of the Japanese market, the world's second largest, and to tap into Japan's growing scientific and technical resources for application in their global technology strategies.⁵ Although one function in one country may seem a rather small window through which to view so large an issue, there are several factors that make it a revealing one. R&D is a function where both intraorganizational linkages with other functions and with R&D elsewhere in the MNC and interorganizational linkages with local sources of scientific and technical expertise and knowledge are of critical importance. In consequence, the organizational dilemma of local and global coordination and integration is cast into high relief, although since the facilities are so new (many are still in the planning stage) the outcome remains uncertain. Moreover, for most firms the establishment of Japan-based R&D facilities means adding a new function in that country, rather than expanding or modifying an existing function, and consequently the constraints of established organizational patterns are not of major importance. Finally, the dominant features of R&D organization in large Japanese corporations and the distinctive features of Japan's technology system (including technical labour markets, the role of universities, and patterns of interfirm cooperation in R&D)⁶ raise some formidable challenges not only to cross-subsidiary coordination but even to the successful development of a Japan-based R&D function in the MNC.

The next section briefly looks at some of the perspectives in the international management field that can be brought to bear on these issues. This is followed by an examination of the dominant patterns of R&D human resource development systems and research management systems within large

Japanese firms, which provide the local model for the new facility. The final section then addresses the question of how the MNC can make the necessary choices between those patterns and its own as it moves to establish an R&D facility in Japan.

1. Localization, Standardization, and Coordination in MNC Organization

As any text on international management points out, multinational corporations, almost by definition, contain higher levels of internal organizational variety than do domestic firms, even those of a comparable scale, because their subsidiaries are located in very different social and political environments. Explanations for the variations across subsidiaries have focused on four major categories of variables: national culture, national regulatory regimes, institutional legacy of the subsidiary, and strategic intent. Recent developments in theories of organization-environment interactions suggest that we can usefully add a fifth category: the pulls toward similarity in structures and processes induced by the interorganizational linkages sustained by each subunit.

The analysis of national culture has focused on societally-induced values, norms, and expectations held by individuals. Therefore advocates of the importance of national culture in the organization of the MNC have tended to emphasize the necessity of conforming to local culture, particularly in its modes of interpersonal interaction and its motivation structures. Because the organizational patterns dominant in the local environment provide the most parsimonious set of indicators of these cultural patterns and how they affect work organization, adapting to local culture has usually been interpreted to mean adopting the behavioural norms and organizational patterns that prevail in large local organizations.⁷

National regulatory regimes impose a different set of constraints on organizational structures and processes, particularly in terms of setting conditions of employment, ownership, and the range of activities in which the MNC can or should engage. In the case of R&D in Japan, this particular perspective is of little direct relevance, since Japanese government regulation touches R&D in the MNC in making a significant Japan-based R&D capacity a condition for participation by foreign firms in Government-sponsored research programmes such as the Fifth Generation Computer project. However, no regulatory constraints determine how that facility should be organized. Indeed the theme of most recent work on national regulatory regimes and the MNC has been the extent of the activities performed within the boundaries of a given nation, rather than on how those activities are organized.⁸

The third category for explaining variation within MNCs focuses on variations in societies' resource environments and on the consequent variation across subsidiaries in their strategic intents.⁹ This perspective is useful in explaining why MNCs are setting up R&D facilities in Japan: the combination of the richness of local scientific and technical resources, the need to keep abreast of Japan-based global competitors in technology, the importance and distinctiveness of the Japanese market, the dynamism of Japanese science and technology as its research community moves to an increased emphasis on generating new knowledge. But like the recent work on regulatory regimes and the MNC, it addresses the issue of what parts of the firm's value-added chain and product line should be located within a country, rather than of how to design the local organization.

The fourth category, the influence of institutional legacy on current organizational patterns, might also seem to be of little relevance, given that for most firms the Japan-based R&D facilities are new, and therefore are not

directly constrained by a legacy of previously institutionalized patterns. However, this perspective is important in understanding the MNC context of the new Japanese R&D facilities, especially in terms of the nature and extent of non-R&D activities that the MNC performs in Japan. Several MNCs that are setting up R&D labs in Japan have extensive local marketing organizations, but do their manufacturing either offshore or through Japanese OEMs. And given that Japan is now one of the world's highest cost manufacturing sites, MNCs are unlikely to make major investments in manufacturing in Japan in the near future. In such a context, many new R&D labs will be in the somewhat unusual position of handing off the technology they develop either to another part of the MNC or to another firm within Japan.

Moreover, few of these MNCs have already built a significant technical presence in Japan that could serve as a base for the development of more value added research activities. In a study of the internationalization of R&D in seven U.S. MNCs before 1973, Robert Ronstadt identified four kinds of foreign R&D units:

1. Technology Transfer Units (TTUs): to facilitate the transfer of the parent's technology to the subsidiary, and to provide local technical services;
2. Indigenous Technology Units (ITUs): to develop new products for the local market, drawing on local technology;
3. Global Technology Units (GTUs): to develop new products and processes for world markets;
4. Corporate Technology Units (CTUs): to generate basic technology for use by the corporate parent.¹⁰

Each type of unit has distinctive linkages with the local subsidiary, the parent organization, and with local sources of technology. Ronstadt has focused on the first two kinds of linkage, but clearly the strength of the ties with local centres of science and technology varies across the four roles. The ties are virtually nonexistent for a TTU, stronger for an ITU, stronger still for a GTU,

and strongest for the CTU.

Given the relatively low level of the manufacturing presence of foreign multinationals in Japan, even their TTUs have been extremely small, and very few have built R&D units beyond that level.¹¹ However, most of the new labs have multiple roles from their inception: they are expected to be ITUs, GTUs, and CTUs. This multiple mandate creates some complex problems. Rondstadt's study identified a clear evolutionary pattern: over time, the TTUs tended to evolve into ITUs, and a subset of the ITUs evolved into GTUs. CTUs tended, where they were successful, to develop GTU or ITU roles. In the present case, these "natural" evolutionary processes are being preempted by the urgency of the MNC commitment to multiple strategic intents within Japan.

The prospect of handing off technology either across national borders or across company boundaries and the multiple roles of the R&D units have implications for organization that are best explored through the fifth category of explanation, which centres on the internal and external linkages of the organization. An important strand in this framework is the concept of "isomorphism." Theories of organizational isomorphism posit that there are strong pressures for increasing similarity across organizations within an organizational field, a concept that is the sociological analogue of the industry: "those organizations that, in the aggregate, constitute a recognized area of institutional life: key suppliers, resource and product consumers, regulatory agencies, and other organizations that produce similar services or products."¹²

Three major premises undergird the work on isomorphism. One is that the ease of interorganizational interaction increases with similarity in organizational structures and processes.¹³ Therefore there is a strong tendency for the patterns of organizations that occupy central positions in resource allocation networks to be emulated by those with whom they interact, either because the

central organization makes such emulation a condition of interaction, or because the less powerful organizations see emulation as a strategy that can increase their access to resources. Secondly, emulation of other organizations is also spurred by management's use of organizational change not only to increase legitimacy and acceptability in the eyes of external constituencies, but also as a powerful internal signaling device, to increase legitimacy and enhance commitment among employees and internal stakeholders. In such cases there are strong inducements to turn to organizational models that are strongly established within the immediate environment.¹⁴ Finally, because in complex organizational systems there is great uncertainty about what patterns are producing certain desired outcomes, managers are likely to look for models to other firms that are perceived as successful. This tendency is reinforced by the growth of the "management industry" of the business press, consultants, and management schools and schools of public affairs, all of whom generate strictures on "best practice" and thrive on the identification of "exemplar" organizations, thereby producing what can be seen either as a growing and increasingly shared sophistication about organizational practice, or as a growing tendency to fads and bandwagons, depending on one's degree of cynicism.

If one applies the the isomorphism paradigm to the MNC, one can portray the MNC subsidiary as subject to two potentially conflicting pulls toward emulation: those within the MNC itself, and those within the society in which the subsidiary is located. The organizational patterns of each MNC system as a whole are in most cases likely to be shaped by the patterns dominant in the home society of the headquarters. But the structures and processes of the organizations which dominate resource allocation within a subsidiary's own society are likely to differ substantially from those dominant within the MNC's home society. Several authors have discussed the problems created for the

MNC headquarters if a subsidiary's dependence on it for resources (financial, technical, or personnel) diminishes over time. Most writers have put the difficulties in terms of an increase in the autonomy of the subsidiary. The isomorphism paradigm suggests that in addition, as the subsidiary draws more resources from its immediate environment, it becomes subject to a changing set of isomorphic pressures. To the extent that these produce organizational patterns that depart substantially from those of the parent, coordination difficulties will increase. Regarding it simply as an issue of management autonomy and control, therefore, may be to miss an important dimension of organizational change.

In addition, the internal constituencies of the subsidiary are apt to have a different set of expectations about patterns that confer enhanced legitimacy and increase commitment than do the internal constituencies of the home country headquarters. If matrix organization is widely recognized as an "advanced" organizational form in the United States, for example, employees of the home country organization of a US-based MNC are more likely to regard a move to a matrix structure positively than are subsidiary employees in a country where matrix organization has not been widely introduced. Such issues have been addressed by the MNC literature largely in terms of differences in culture; the isomorphism directs attention more to the specific organizational patterns that dominate an organizational field within a society than to the more general value orientations of individual employees.

This emphasis on the important influence of the organization's external linkages is an important complement to the current focus on internal linkages within the multinational corporation; it also focuses more attention on the organizational implications of both kinds of linkage. Both are important perspectives in helping MNC managers make decisions about organizational

design in subsidiaries.

R&D facilities in Japan provide a case in point. Their managers confront four interrelated challenges: setting the R&D agenda; building a human resource development system; establishing a research management system; and building the "knowledge networks" with the Japanese organizations that are sources of scientific and technical information and stimuli to innovation. In facing the last three issues, they must decide whether to follow the patterns of their own organization, to emulate those which prevail in comparable organizations in Japan, or to compromise in some fashion between the two. To the extent that the established patterns of R&D in the multinational resemble the dominant Japanese patterns, the MNC faces relatively few problems in deciding how to design its HRD and research management systems in the Japanese context. But to the extent that its own patterns are different from the prevailing Japanese model, then managers face no small difficulty in making these decisions.

The following section summarizes the main features of R&D organization in large Japanese firms, as a background for assessing how MNC managers can make decisions about how important a model these should be for their own organization.

2. Organizational and Interorganizational Patterns of R&D in Japan

In Japan, there are greater similarities in the structures and processes of large-scale organizations across industries and across sectors than is the case in societies whose industrial development was less compressed in time. As a result, it is possible to speak of "Japanese" patterns of organization in large firms without as much danger of overgeneralization as is the case with the United States and Europe, although of course there are still important differences across individual firms and between firms and government and

university structures. In R&D, there are a number of commonalities across large firms, especially in human resource development systems. These are shaped in large part by the general HRD systems of large Japanese firms (the recruitment of new graduates, longterm employment, standardized rewards, and so on) but have some distinctive features produced by the nature of Japanese technical labour markets.

In Japan, as in most societies, the universities are the major source of scientific and technical personnel. In Japan, however, the leading universities play a more important role in allocating technical people to firms than in most highly industrialized societies. Especially for the Master's graduates who constitute the lion's share of the recruits to R&D laboratories, the professors at the elite universities allocate their students among a core group of leading companies in the industry. The professor writes one recommendation letter to one leading company for each of his Master's students; the company will as a matter of course hire that student; and students do not feel free to approach a major company to which the professor has not written. For the Bachelor's graduates who are recruited into divisional labs, the university placement offices are the most influential channel for guiding students into firms. The professors and the placement offices therefore assume considerable responsibility in evaluating firms to make sure that they provide secure and predictable career ladders for their recruits. In other words, they favour the large, established companies over smaller firms. This is one of the strong "isomorphic" pulls on R&D organization in Japan: firms with aspirations to recruit Master's graduates from the elite universities must conform to certain organizational patterns of long-term commitment to employees, sustained commitment to spending on R&D in large and well-equipped laboratories, and a sustained relationship with the elite universities.

The number of mid-career recruits into the R&D organization of large firms is very small compared to most Western societies. In principle, large firms do not recruit from other organizations in either managerial or research positions. However, there are perhaps more exceptions for R&D than for any other function. Under certain circumstances -- such as expansion into new research areas, or extremely rapid growth in a certain field, or a "hole" in the cohorts from which project leaders are chosen because an earlier economic slowdown contracted recruitment in the past -- the firm will go to the elite universities, government laboratories, or public corporations such as NTT or NHK (but not, be it noted, to competing firms) to hire researchers in their early or mid-thirties. A recent study of fifteen leading firms in eight industries found that of a total intake of 2,400 researchers in 1984, only 90 (3.7%) were mid-career recruits. The ratio of mid-career hires was highest in the heavy machinery industry, where the firms were making strenuous efforts to develop new business fields; five of the fifteen firms hired no mid-career researchers at all.¹⁵

Given this heavy reliance on new graduates, firms can and do put their R&D hires through a standardized entry-level training programme. Nearly all large firms combine the training of their research recruits with that of their managerial recruits, in several months of full-time training that includes intensive education about the company as a whole and rotation across functions (in Oki Electric Company, for example, both managerial and technical recruits even spend some time in a retail store selling Oki products, to provide them with direct exposure to customers).

Given the difficulties of hiring mid-career researchers and given the nature of Japanese university education, companies also seem to assume greater responsibility for training researchers in Japan. Graduates of Japanese science

and engineering departments are less likely than their U.S. counterparts to have experienced internships or summer jobs in companies or to have industry-related research experience within the university lab. Education also tends to be more general and theoretical. As a result, R&D managers in Japan say that it takes about two years of primarily on-the-job training to bring a Masters graduate up to the level of making an independent contribution to research projects. But while on-the-job training by more experienced researchers remains the primary vehicle for enhancing the skills of the new researcher, off-the-job training is also significant. A 1979 survey of off-the-job training practices in leading Japanese firms found that over the previous three years 6.4% had been dispatched to other companies or industrial associations on research projects with a training agenda; 5.7% had studied at the graduate school of a foreign university or engaged in a cooperative research project overseas, and 9.7% had enrolled in graduate courses at a Japanese university or been sent on temporary assignment to an outside research organization.¹⁶ The practices of sending researchers to external research organizations and other firms as part of an HRD strategy is widespread. Although systematic comparison is not possible without similar data for U.S. firms, the use of external assignments as a training mechanism seems more widespread in Japan.

The entry-level training program also provides the company with an opportunity to assess the potential of each recruit, and initial job assignments are made at least in part on the basis of performance in training. But evaluation is a long-term process. One common characteristic of large Japanese firms is that the time frame for the evaluation of their researchers as well as of their managerial employees is from five to ten years. During this period, most firms provide their researchers with virtually no formal evaluation feedback. Researchers have no access to their annual evaluation reports, and

there are few companies that formalize performance assessments. The companies rely instead on the intense interaction between superiors and subordinates to provide constant informal signals. This is in marked contrast to the prevailing patterns in U.S. research organizations, where formal performance appraisals and feedback interviews are standard. In both the U.S. and Japanese systems research managers and project leaders have significant responsibility for fostering the development of their subordinates. In the United States, however, the emphasis tends to fall on formal evaluation and feedback procedures; in Japan, on informal interactions.

This in turn is linked to a pervasive difference between the reward structures of the two systems. Most U.S. R&D organizations use some form of performance-based compensation, and an important function of the formal feedback procedures is to justify to each researcher the size of his or her pay package for the next year. Large Japanese firms, on the other hand, have a highly standardized salary and promotion structure, where outstanding achievement is not rewarded by significant pay increases. Salaries are virtually uniform across functions and areas, with seniority being the prime determinant of income.

This standardized reward system facilitates the transfer of research personnel that is a key feature of career structures and technology transfer in many large Japanese firm. In most leading firms, technology is transferred from R&D to manufacturing by transferring one of the project members to a divisional laboratory or engineering facility attached to the manufacturing division. In many firms this is not a temporary transfer but the next move on a career ladder that will eventually move into line management. Since nearly all researchers follow this career line, the move is generally accepted if not welcomed, even by those researchers who regret leaving advanced development

work. The personnel transfers that are the primary vehicle for technology transfer exemplify one of the principal general features of the Japanese HRD system in R&D. In Japan, the locus of responsibility for the individual researchers' career clearly lies with the company. From the initial training through the assignment of researchers to projects and to post-entry training, the responsibility for planning a career that makes the best use of each individual's abilities (the best use for the company, not necessarily the individual) rests with the company. Yet this does not seem to require larger personnel departments in Japanese R&D organization; the guidance comes from R&D managers themselves, rather than from personnel specialists.

Less systematic information is available on project management systems in Japanese firms than on HRD systems. The mode of technology transfer (linked as it is to HRD systems) is the clearest: the movement of researchers from the project through the production process. This pattern has been facilitated by the expansion of development facilities attached to product lines or to regional manufacturing facilities over the last ten years. Not only has the enhancement of the technical capability at the manufacturing facility helped in incremental product and process innovations; it has enabled the firms to hold down the size of their central R&D facilities, most of which have grown very little over the last decade. The relatively small size of the central lab in turn fosters the ongoing reliance on informal means of project monitoring. Compared to U.S. firms, Japanese central R&D laboratories have fewer formal systems for scheduling and checking on research projects. However, the open office systems and the consequent daily communication enable research managers to keep a close informal watch on the progress of various projects.

A recent study comparing Japanese and U.S. computer firms produced the following points of contrast in project management: Japanese firms exhibited

greater reliance on informal methods of monitoring projects; less weight given to technical expertise in the selection of project leaders and more to seniority, past experience in successful projects, and administrative ability; and a longer period of "pre-project" work (exploratory research before formal project commitment) and a corresponding level of slack built into research budgets to accommodate it.¹⁷

Finally, the "knowledge networks" in the Japanese technology system -- the linkages across the various organizations that are sources of scientific and technical knowledge and expertise -- differ somewhat from those in the United States and Europe. Universities are of more importance as a source of personnel than as centres of research. However, they remain important centres of information about developments in the research community, in part because employees of large firms and government laboratories generally maintain regular contact with their former professors, and in part because the professors in the elite universities are themselves participants in government technology advisory committees and projects.

Firms in Japan are also likely to have an extended portfolio of joint research projects: with other firms, with government labs, and even (somewhat surprisingly in view of the widespread belief in the poverty of the research capacity of Japanese universities) with Japanese universities. Most of the attention paid to interfirm R&D projects has focused on the large-scale government-sponsored projects that bring together competitors to work together under a single project structure, such as the VLSI project or the Fifth Generation Computer project. However, firms participate much more extensively in joint projects with their suppliers or with client firms (Exhibit 1¹⁸).

(EXHIBIT 1 ABOUT HERE)

Relatively little public information or research exists concerning the operation

EXHIBIT 1: JOINT RESEARCH PROJECTS IN JAPANESE FIRMS

	A	B	C	D	E	F	TOTAL
	JAPANESE	FOREIGN	THINK	OTHER	GOV'T &	FOREIGN	
	UNIVERSITIES	UNIVERSITIES	TANKS	COMPANIES	PUBLIC LABS	COMPANIES	
<u>MATERIALS & CHEMICALS</u>							
KYOWA HAKKO	60	0	0	3-5	8-10	3-5	74-80
KONISHIROKU	2-3	1-2	4-5	4-5	-	4-5	15-20
DAIKIN	10	2-3	0	10	5	5	32-33
DAIDO	5-10	1-2	-	10-20	5-10	-	21-42
DAINIPPON INK	10	1-2	10	20-30	6-8	4-5	51-65
<u>CONSUMER PRODUCTS</u>							
KAO	40-50	8-10	3-4	10-15	8-10	-	69-89
NISSHIN	10-12	2-3	1-2	14-15	3-5	3-4	36-46
MEIJI	10-12	203	1-2	14-15	3-5	3-4	36-46
SNOW	40-50	3-4	-	5-10	5-10	2-3	55-77
LION	20-30	3-5	-	10-15	10-15	5-10	68-105
<u>MACHINERY & EQUIPMENT</u>							
KUBOTA	6-10	2-5	-	10-15	10	-	28-40
NIPPON KOGYO	30-40	4-5	-	10	10	-	54-65
HOCHIKI	5-6	-	1-1	2-3	1-2	1	10-14
YANMAR	4-5	1-2	-	3-5	2	2-3	12-17
<u>ELECTRICAL</u>							
SUMITOMO EL.	40-50	3-4	25-30	30-40	10-15	-	108-139
TOSHIBA	60	2-3	-	-	-	1-2	63-65
HITACHI	20-30	30-40	30-40	5-10	40-50	5-10	130-180
<u>CONSTRUCTION</u>							
SHIMIZU	15-20	3-5	5-10	50-60	10-15	-	93-125
TAKENAKA	4-5	1-2	-	20-30	4-5	-	29-42
<u>ELECTRIC POWER</u>							
TOHOKU							
DENRYOKU	40	-	15	150	5	-	210

of these projects, but they seem to run the gamut from small projects with relatively little interaction between the two firms to truly joint research, with an exchange of researchers and frequent problem-solving meetings. Those projects that involve the exchange of researchers are also a part of the HRD programmes of the firm. The exchange of researchers and close interfirm coordination on R&D projects are facilitated by the similarities in career structures, reward systems, and project management practices across Japanese firms. Especially critical are what Yoshino and Lifson have dubbed (in the context of Japanese trading companies) "parallel hierarchies", that is, structures by which "people who entered each bureaucracy can be expected to have contemporaries who entered the others in the same year and who are at approximately the same levels of responsibility and discretion."¹⁹

One last feature of the "knowledge networks" of Japanese R&D organization should be noted, and that is the strong professional orientation among researchers. Western writers on the Japanese technology system have asserted that professional orientation is relatively weak among researchers in Japan's large corporations, given the system of lifetime employment and their presumably strong company orientation.²⁰ However, the comparative study of the computer industry referred to above found that researchers in the Japanese firms were more likely than their U.S. counterparts to belong to professional associations, attend professional meetings, and to feel that their company encouraged them to publish their research results. The importance of the professional associations in the knowledge networks in Japan has been overlooked in the Western-language literature on the Japanese technology system; it should not be overlooked by the Western firm entering Japan with R&D facilities.

The portrayal of the patterns of R&D in Japanese firms would be

incomplete without some assessment of the direction of change. The dynamic evolution of R&D from the early 1950s, when most leading firms in Japan established their first research organizations, has continued to the present day. The current trend of change is the identification of basic research and the generation of original technology as major national priorities by both government and private industry. This has led to growing criticism of the rigidities of R&D careers and organization as a legacy of an earlier stage of manufacturing-oriented R&D. The parallel hierarchies and standardized organizational careers that have so facilitated the internal transfer of technology from the lab to the factory, collaborative interfirm research, and the exchange of researchers across companies is increasingly criticized as stifling individual creativity and discouraging lifetime commitments to research.

The Japanese press, younger Japanese researchers, and Japanese R&D managers are engaged in increasing discussion of the desirability of mid-career recruitment, performance-based evaluation and reward systems, promotion by technical achievement rather than seniority, and greater variety of careers within R&D to allow for more specialized and longer-term technical ladders. There is growing scrutiny of personnel practices in U.S. and European research organization that foster basic research and major technology breakthroughs.²¹ Yet despite some very conscious but isolated emulation of certain Western patterns (such as the "blue sky room" at Canon's central research laboratory), there has so far been little actual change in the overall organization of R&D. This in itself suggests the strength of the systemic supports for the current patterns, whose standardization facilitates both internal technology transfer and interfirm cooperative research. It is in fact unclear what the direction and extent of future change will be, and this adds yet another dimension of complexity for MNC managers: emulating the patterns dominant in Japan today

may mean adopting an obsolescing model.

3. Organization Design in the R&D Subunit in Japan

The concept of national culture as the major determinant of organization would suggest that all MNCs face a common set of constraints and expectations in setting up R&D facilities in Japan, based on "Japanese-style management". On the other hand, both the perspective that urges the importance of a strategic mandate to fit the local and the corporate environments and the isomorphism perspective argue for considerable variation across MNCs, depending on the actual and anticipated networks of the Japanese subunit.

In the simplest terms, the emulation of the MNC corporate patterns of R&D organization in the Japanese lab would be most appropriate under the following conditions:

- (a) when the technology generated by the local R&D organization is routinely transferred across borders to other parts of the MNC;
- (b) when linkages between the local lab and corporate R&D are dense and sustained;
- (c) when organizational patterns are seen as a critical element of the firm's competitive advantage (the most vivid contemporary example is not in R&D but in manufacturing: Japanese auto firms have invested heavily in training blue collar workers in their distinctive production systems).

These conditions are most likely when the Japanese lab is developing technology for use in the MNC's global markets (GTU) or is generating basic research for further development in the corporate lab (CTU).

On the other hand, emulation of locally dominant patterns will be favoured:

- (a) when technology is routinely transferred to local manufacturing operations:

(b) when linkages with local R&D organizations and the local scientific and technical community are dense and sustained.

These conditions are most likely when the lab is focusing on developing technology for use in the Japanese market.

However, in fact the Japanese R&D facility may well be faced with conditions of both types. Technology may be transferred both to local and to offshore manufacturing facilities (as is increasingly the case for IBM-Japan, in the face of the rapidly appreciating yen). The local lab may also be trying simultaneously to develop close linkages with corporate R&D and with local R&D organizations, as it must when it is playing the combined role of an ITU, a GTU, and a CTU, and when its technical capacity is brought to critical mass by leveraging it with cooperative projects with the corporate lab and with local partners or "strategic allies". The importance of such leveraging strategies, in turn, is reinforced by the peculiar difficulties of recruitment in Japan's technical labour markets. These three processes -- recruiting, leveraging technical capacity, and technology transfer -- are of critical importance in deciding how (as opposed to whether) to balance local and corporate organizational models.

The R&D subunit will have to recruit in two markets that at first blush may seem to place contradictory demands on its organization. The recruitment of new graduates is controlled by professors and placement offices at the universities. Their principal criterion for directing students towards employers is the company's capacity for assuring them of a long-term career that provides the opportunity for the full development of their abilities. Many Western employers equate this with "lifetime employment" or job security, but it goes well beyond a commitment to keep an individual on a payroll. It demands a company that has the resources and the organization to enable the technical

graduate to develop his capacities to the full. It also means a company which accepts its responsibility for the careers of its employees in the fullest sense of the word, and therefore usually implies a high measure of guidance and career structure.

On the other hand, mid-career recruits are likely to be those who are dissatisfied with the constraints of their careers in large Japanese firms and who want more choice in the direction of their careers. They are more apt to be attracted by a lower level of career structure.

One solution may be to develop a career structure in which autonomy and choice increase over time, and in which the "Japanese" patterns of emphasizing the research manager's responsibility for developing the skills of junior people and research management's responsibility for overall career opportunities are combined with a "Western" pattern of soliciting greater involvement of individuals in planning their own careers and providing greater feedback on what the individual's attainable prospects might be.

Because of the relative newness of most of the MNC labs in Japan, clear career planning will be of critical importance. In the large Japanese firm young researchers can easily visualize the long-term contours of their careers by observing those of their older colleagues. The MNC lab that is "ramping up" in staff and research agenda does not provide such models, and therefore the likely options have to be made explicit and the young researchers convinced that the R&D agenda of the facility will be set with one eye to the longterm implications for human resource development even as the other eye is firmly fixed on the immediate output of technology as a contribution to the overall strategy of the firm. Researchers will probably want evidence that the MNC has at least considered seriously what the people it is hiring today are likely to be doing in twenty years.

Reward structures are of course related to recruitment. The strengthening yen has made it increasingly difficult for U.S. and European firms to consider trying to attract research staff simply by offering significantly higher salaries than the leading Japanese firms, even if that had been a viable option in the past. They can, however, offer inducements such as a performance-based reward system in which pay is less tightly coupled to seniority and rank than in Japanese firms, the prospect of a long-term research career (as opposed to the relatively early move into application and then line management of most Japanese firms), and overseas experience in the corporate labs or in Western universities. This last also may be a useful way to develop the technical skills of the Japanese recruits (and it should be accompanied by a willingness to send such people to an intensive summer language programme abroad, as most Japanese firms do to prepare technical employees for overseas assignments).

Short-term assignments to the corporate lab can also provide a way of leveraging the capacity of the local lab, if they are part of a programme of joint research projects. Leveraging of some form is a necessity. In its early stages of development, the Japanese R&D subsidiary is relatively small, and yet to attract good people it must have a research agenda that includes challenging projects. The corporate lab can contribute to enhancing the Japanese lab's capacity to do such research in at least three ways:

- (a) Joint projects, accompanied by an exchange of researchers on short-term assignment;
- (b) Dispatching researchers from the corporate lab to work in the Japanese lab;
- (c) Sending a senior, professionally established scientist from the corporate lab on short-term assignment (especially someone working in basic or very advanced areas) to interact with the Japanese scientific and technical community, raise the facility's visibility, and symbolize the MNC's commitment to Japan. To the

extent that the Japanese lab is expected to be tightly coupled with the corporate lab in the long term, as well as in its early stages (i.e. to the extent that it has a CTU role), emulation of the corporate patterns will likely facilitate its development.

But in addition, the lab can leverage its capacity by drawing on outside organizations:

- (a) Joint research projects with Japanese firms who are suppliers or customers, accompanied by an exchange of researchers;
- (b) Joint projects with Japanese university professors, with the dispatch of one or more employees to the university lab;
- (c) Joint projects with other MNC research subsidiaries in Japan.

The ITU role is more likely to favour the ongoing resort to such strategies.

If both methods (corporate linkages and local linkages) are chosen -- the likeliest strategy -- then how can the lab deal with the potentially competing pulls on its organizational processes? More systematic empirical case research is clearly necessary before this question can be answered with any confidence, but one possibility is the combination of the following:

- (a) A dual project management system, with one pattern (for projects with Japanese companies) that emulates the communications patterns, decision-making patterns, and role division of the Japanese system, and another that emulates the patterns of the corporate lab;
- (b) training programmes that spell out for researchers in the local lab the differences between the two systems and the rationale behind each, in order to create "ambidextrous" researchers who can function in both systems;
- (c) an effort to involve the researchers themselves in self-conscious learning about which patterns facilitate which kinds of projects.

Finally, technology transfer across borders is an area where the experience

of the corporate laboratory is critically important, and where corporate patterns should provide the model. Few Japanese firms have yet systematically developed methods of transferring technology directly from their Japanese labs to production operations overseas. The dominant mode is still to make the initial transfer to Japan-based production facilities, and then transfer the technology to facilities overseas after the learning process is virtually complete. American and European firms are far more likely to have extensive experience in developing systems for cross-border technology transfer across functions.

CONCLUSION

In summary, the Japan-based R&D subsidiary faces some problems that are peculiar to the Japanese environment and to the existing level of foreign MNC presence there. But the dilemma of how to organize such a facility has general implications that go well beyond the country-specific application. The organizational structures and processes in any national subsidiary are strongly influenced by the kind and intensity of linkages within and across the boundaries of the MNC, and they in turn influence the efficiency and effectiveness of those linkages. As managers increasingly move to change those linkages, the theory and practice of international management must move to focus on their relationship to the MNC's organizational patterns at the corporate and local levels. The case of the emerging Japan-based R&D subsidiaries provides both a fascinating test in prospect for our existing theories and practices and a venue for improving them.

1. Christopher Bartlett and Sumantra Ghoshal, "Tap your subsidiaries for global reach" Harvard Business Review 64-6 (1986): 87-94, and Managing across Borders: The Transnational Solution (Boston: Harvard Business School Press, forthcoming).
2. See Farok Contractor and Peter Lorange, eds., Cooperative Strategies in International Business (forthcoming).

3. See for example M. Therese Flaherty, "Coordinating International Manufacturing and Technology" pp. 83-109 in Michael E. Porter, ed., Competition in Global Industries (Boston: Harvard Business School Press, 1986).
4. Yves Doz and C. K. Prahalad, "Controlled Variety: A Challenge for Human Resource Management in the MNC" in Human Resource Management 25-1 (Spring 1986): 55-71; Gunnar Hedlund, "The Hypermodern MNC - A Heterarchy?" in *ibid*: 9-35. An interesting aspect of these discussions is that the writers simultaneously assert the need for multinationals to expand their capacity to tolerate great internal variation in governance structures and other structural patterns.
5. The trend is most marked in the computer industry (Digital Equipment and Data-General); chemicals (Dupont, ICI, Ciba-Geigy, and W.R. Grace); and cases such as Eastman-Kodak, for whom Japanese firms have become formidable competitors.
6. See for example Hugh Patrick, ed., Japan's High Technology Industries (Seattle: University of Washington Press, 1986); Ryuzo Sato, "Japan's Challenge to Technological Competition and its Limitations", pp. 237-254 in Thomas A. Pugel, ed., Fragile Interdependence: Economic Issues in U.S.-Japanese Trade and Investment (Lexington, Mass: Lexington Books, 1986); D. Eleanor Westney and Kiyonori Sakakibara, "Comparative study of the training, careers, and organization of engineers in the computer industry in Japan and the United States," Working paper for the MIT-Japan Science and Technology Program, 1985.
7. This is clearly an oversimplified summary of an extensive and complex literature, much of which is ably summarized in a recent text by Simcha Ronen, Comparative and Multinational Management (New York: John Wiley & Sons, 1986). See also Gert Hofstede, Culture's Consequences: International Differences in Work Related Values (Beverly Hills: Sage, 1980); N. J. Adler, "Cross-cultural Management research: the ostrich and the trend" in Academy of Management Review 1983 (8-3):226-232.
8. Thomas A. Poynter, Multinational Enterprises and Government Intervention (London: Croom Helm, 1985); Yves Doz, "Government Policies and Global Industries," pp. 225-266 in Michael E. Porter, ed., Competition in Global Industries (Boston: Harvard Business School Press, 1986).
9. R.E. White and T.A. Poynter, "Strategies for Foreign-Owned Subsidiaries in Canada" Business Quarterly (Summer 1984); Sumantra Ghoshal and Nitin Nohria, "Multinational Corporations as Differentiated Networks" (MIT Working Paper 1987); Christopher A. Bartlett and Sumantra Ghoshal, Managing across Borders: The Transnational Solution (Boston: Harvard Business School Press, forthcoming).

10. Robert C. Ronstadt, "R&D Abroad by U.S. Multinationals" in Robert Stobaugh and Louis T. Wells Jr., eds., Technology Crossing Borders: The Choice, Transfer, and Management of International Technology Flows (Boston: Harvard Business School Press, 1984): 244.

11. The most important exception is IBM, which has gradually built its R&D capacity in Japan to the level of a GTU.

12. Paul J. DiMaggio and Walter W. Powell, "The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields" American Sociological Review 1983, Vol. 48 (April): 148.

13. Empirical work in the field of international management has provided some supporting evidence for this: for example, Kathryn Harrigan's work on the importance of similarities across partners in K.R. Harrigan, Strategies for Joint Ventures (Lexington, Mass: Lexington Books, 1985), and Therese Flaherty's observation that "it is easier and cheaper to coordinate operations which have more in common" in "Coordinating International Manufacturing and Technology" pp. 83-109 in Michael E. Porter, Competition in Global Industries.

14. John Meyer and Brian Rowan, "Institutionalized organizations: formal organization as myth and ceremony" American Journal of Sociology 1977, Vol. 83: 340-363.

15. Seisaku kagaku kekyujo, Gijutsu Kaihatsu sokushin no joken chosa hokokusho (Report of an investigation of the advancement of technological development). Research report, March, 1986. Pp. 61-62.

16. Ibid., p. 380.

17. D. Eleanor Westney and Kiyonori Sakakibara, "Comparative study of the training, careers, and organization of engineers in the computer industry in Japan and the United States." Working paper for the MIT-Japan Science and Technology Program, 1985. Subsequent interviews in firms in other industries suggest that these patterns characterize firms beyond the computer industry.

18. The data in Exhibit 1 are compiled from information given by twenty of the thirty firms which provided dense descriptions of their R&D structures a study of R&D in Japan by the Japan Management Association and published in Japanese as: Nihon Noritsu Kyokai, Kenkyujo Un'ei Kasseika Jitsurei Shu (Tokyo: Nihon Noritsu Kyokai, 1987).

19. M.Y. Yoshino and Thomas B. Lifson, The Invisible Link: Japan's Sogo Shosha and the Organization of Trade (Cambridge, Mass: MIT Press, 1986): 238-9.

20. See for example Gary R. Saxonhouse, "Industrial Policy and Factor Markets: Biotechnology in Japan and the U.S." in Hugh Patrick, ed., Japan's High Technology Industries: Lessons and

Limitations of Industrial Policy (Seattle: University of Washington Press, 1986): 127-128.

21. For example, the preceding citation is to a report by a study group set up by a Japanese foundation for scientific research: it conducted interviews at 22 Japanese companies and 10 U.S. and European research organizations (including IBM, GTE, 3M, and MIT), and interviewed 9 individuals with research experience in foreign institutions.