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# Accessing Innovative Capabilities: The Strategic Importance of Technology in Post-Modern Strategy

by

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## I. Introduction

This paper focuses on the current transformation of the strategic management field and the rise of a significant new era in strategy. This new phase, called "Post-Modern", has key features which distinguish it from previous periods of strategy thinking. In particular, it is characterized by the rising priority, and in some cases dominance, of innovation as a major strategic variable. As can be seen in Figure 1, Post-Modern Strategy represents a significant change in top-level decision making in the postwar era and increasingly characterizes the cutting edge of strategic practice today. It blends certain features of General Management and strategic planning thinking while also exhibiting new concepts of its own. Moreover, it is both less universal and less elegant than its predecessors. It is more varied, contingent, and complicated in the way its diverse parts have been both disaggregated and reintegrated. It stresses such strategic matters as implementation, the creation of multiple organizational strategic support systems, processes, and pressures, the role of a firm's unique culture and history in setting and influencing strategy, internal entrepreneurial units, the increasing use of interorganization networks and linkages, the growing importance of what is now termed global strategy, advanced and targeted analytical strategic approaches, and the relationship between corporate strategy and various functional strategies.

A major challenge for large corporations belonging to the Post-Modern age is to develop the capability to generate simultaneously a number of diverse, and perhaps seemingly contradictory, strategic management approaches. What is the cause of such a major change in the configuration of strategic management? The answer clearly lies in the current transformation of competition in much of the world. Today competitive success increasingly requires achieving higher value objectives, which often means satisfying a range of complex and often changing demands by the customer throughout the value chain for greater innovative capability in products and services. Consequently, the key strategic objectives are shifting. In the 1970s, extending and mining a product line via market-share dominance, for example, was as important a goal as creating new products and services. With the arrival of Post-Modern Strategy there is a move away from simply the extension of value and toward the creation and transformation of value. Strategic actions that encourage value-intensive differentiation, such as increasing the importance of internal research and development, entering into joint ventures to design and create new products, disaggregating structure (to allow for flexibility and freedom of action in order to encourage innovation), and reintegrating structure in complex ways (to permit appropriate economies of scale and scope), assume higher priority.

## Figure 1

### The Postwar Evolution of Strategic Management

**Phase I: 1950s-Late 1960s**

**The General Management Era**

- The Importance of Leadership
- Universal Managerial Characteristics
- The Universal Professional Manager
- View the Firm as a Whole
- Optimism
- Top Management Oriented
- Implicit Strategic Management

**Phase II: Late 1960s-1980s**

**The Golden Age of Strategic Planning**

- The Rise of Analysis
- Strategic Approaches
- Strategic Portfolio
- Incorporation of Industrial Organization and Micro-Economic Approaches
- Viewing the Firm as Made Up of Component Business That Have Different Strategic Roles
- The Rise of Support Industries and Institutions, e.g. Strategic Consulting Firms, Business Schools, and Strategic Databases
- The Emergence of a New Function, Profession and Unit: The Strategic Planning Staff
- Formulation Oriented
- Staff Oriented
- The Centralization and Growth of Power of Strategic Planning
- Explicit Strategic Management

## Phase III: 1980

### Post-Modern Strategic Management

- Reaction to Strategic Planning
- Renewed Interest in Implementation
- Emphasis on the Role of Culture and History in Determining a Firm's Strategy
- The Rise of Global Strategy
- Targeted and Advanced Analytical Strategy
- The Concurrent Use of Multiple Kinds of Strategic Support Systems, Processes, and Structure
- The Elevation of Technology to a Strategic Variable
- The Use of Interorganization Networks and Linkages in Strategy
- The Simultaneous Deployment of Multiple Strategic Approaches - Blending Implicit and Explicit Strategy

This important reorientation of major objectives is a key factor in the elevation of technology as a strategic variable and the creation of "new linkages" by corporations for technology acquisition. For technology-intensive firms in practically all parts of the world, therefore, incorporating technology into corporate strategy is probably the greatest challenge now facing top managers in <u>all</u> functions of an enterprise.

## II. The Practice of Post-Modern Strategy: Technology Strategy and Value Creation Networks as Cases in Point

A major indicator of overall Post-Modern Strategy and perhaps the most distinctive feature of this new wave of top management behavior is the rise of what may be termed Technology Strategy in the mid-1980s. The recognition of technology as a top-level strategic concern for a corporation and technology's elevation to a strategic variable are due to the convergence of many of the same forces that, by the 1980s, had created the need for Post-Modern Strategy management as a whole. The full impact of such historical trends --including the negative reaction to strategy planning, the success of the small high-technology firm, the increasingly strategic importance allocated to technology by foreign competition (particularly the Japanese), the related rise in status of manufacturing as a strategic weapon, and the supportive relevant thinking and research in the fields of strategic management and the management of technology-- is visible, widespread, and powerful. Technology Strategy has now emerged as an important and pace-setting management activity in the modern corporation.

Technology Strategy is part of the growing concern for creating and maintaining increasingly higher value strategic actions. Technology Strategy also focuses on the design and implementation of novel kinds of structures. Technology Strategy confronts continuously the critical tradeoff between the benefits of large-scale-oriented economies of size, scope, and synergies and the benefits small-scale-oriented individual or decentralized entrepreneurialism, flat organizations, and fast response to users and the market. A key part of Technology Strategy also involves the challenge of creating the requisite set of "new linkages" with organizations external to the firm. Finally, in developing a way to put these and possibly other elements together Technology Strategy must cope with the probable need to manage concurrently inherent contradictions for the long-term strategic success of the enterprise.[1]

Technology Strategy is characterized first of all by disaggregation--the purposeful fragmentation, decentralization, and flattening of an enterprise in order to promote risk taking and innovation. In part, the new emphasis on disaggregation was a somewhat delayed reaction by large corporations to the dramatic and successful experience in the U.S. of small-firm high-technology entrepreneurialism and the continuing vigor of medium size companies, which tended to highlight the benefits of decentralized, small, and flat organizational structures.[2] Disaggregation actually represents a significant change of emphasis in the evolution of the large corporation. Instead of continuing to internalize transactions through coordination and administered hierarchies where appropriate, as large firms had been doing since the late nineteenth century, by the early 1980s these entrerprises were seeking ways to loosen up and operate in less coordinated smaller units.[3]

At the same time, however, Technology Strategy does not neglect the benefits of large size and the economies of scale and scope, when they can result value-intensive strategic success.

Clearly, in many instances such traditional advantages of market power as volume production, mass marketing, and large industrial R&D facilities can lead to significant strategic achievement. A process of complex reintegration is also occurring, and this new method of assembling a high value critical mass is particularly effective in the current competitive environment. This type of action essentially permits not only the effective mobilizing of internal resources but also the selection of external sources for achieving strategic advantage. Complex reintegration allows make-versus-buy of high value resources, especially technology. Therefore an important distinguishing feature of Technology Strategy today is a growing use of fluid and network-like interorganization structures--such as strategic alliances--as well as better and varied use of the traditional hierarchical corporate form.[4]

Consequently, a key aspect of Technology Strategy is that it is working to modify the shape and structure of the modern corporation by actually promoting the externalization of transactions where appropriate. The whole matter of procurement and make versus buy is becoming increasingly critical because of the ever growing requirement for accessing innovative capabilities.

Modern Technology Strategy demands that top managers throughout the enterprise balance concurrently disaggregation (in order to capture the benefits of flat organizations and an entrepreneurial zeal) and complex reintegration (in order to exploit the advantages of particular kinds of critical mass). Therefore, implementation of Technology Strategy often requires the kind of action that permits the continuous blending and coexistence of seemingly opposite kinds of behavior and strategies. This crucial quality in Technology Strategy is termed Simultaneity, the simultaneous incorporation of diverse and often seemingly contradictory elements in order to achieve a larger set of strategic objectives. The ability to demonstrate Simultaneity on an ongoing basis is increasingly critical for strategic success today.

It is important to realize that key characteristics of Technology Strategy today are quite different from salient features of private-sector technological innovation that existed through approximately the 1970s. In that earlier era, at least in the U.S., private-sector technological innovation was segmented between small and medium-size firm innovation and the traditional industrial R&D done in the large corporation. These two types of innovative activity operated according to different rules and priorities and the U.S. benefited from the their coexistence.[5] By the early 1980s, however, as technology became increasingly strategic, the boundary between the two major forms of private-sector technological innovative activity--small-firm and large-corporation innovation--began to fade. This blending of these previously distinctive modes is a salient feature of modern Technology Strategy.[6]

Focusing now on the needs of the large corproation, Technology Strategy can be viewed as a complex array of trade-offs, relationships, and linkages that must to be managed in a highly sophisticated fashion. The specific nature of these tradeoffs are depicted in Figure 2. Three key aspects of Technology Strategy are presented. According to this framework, large modern technology-intensive corporations are making Technology Strategy decisions along three dimensions: competition vs. cooperation [competitive strategy]; internal (make) vs. external (buy) technology [domain]; and traditional large corporation industrial R&D vs. decentralized, small, entrepreneurial units vs. interorganizational networks [structure]. Achieving the appropriate set of multiple trade-offs and locations along these dimensions is one of the major tasks in Technology Strategy today.

There is a substantial, varied, and ever-increasing empirical database that supports this general notion of Technology Strategy. One study examined the Technology Strategy of a representative set of firms from the population cohort consisting of those 97 U.S.-based Fortune 500 companies that had spent at least $80 million on R&D in 1982.[7] Several methods for technology development and acquisition were identified, as seen in Figure 3. Technologies developed in the industrial R&D laboratory or in entrepreneurial subsidiaries represent the fruits of internal techniques of development. The remaining techniques can be considered external methods of technology development or acquisition. A review of both the Wall Street

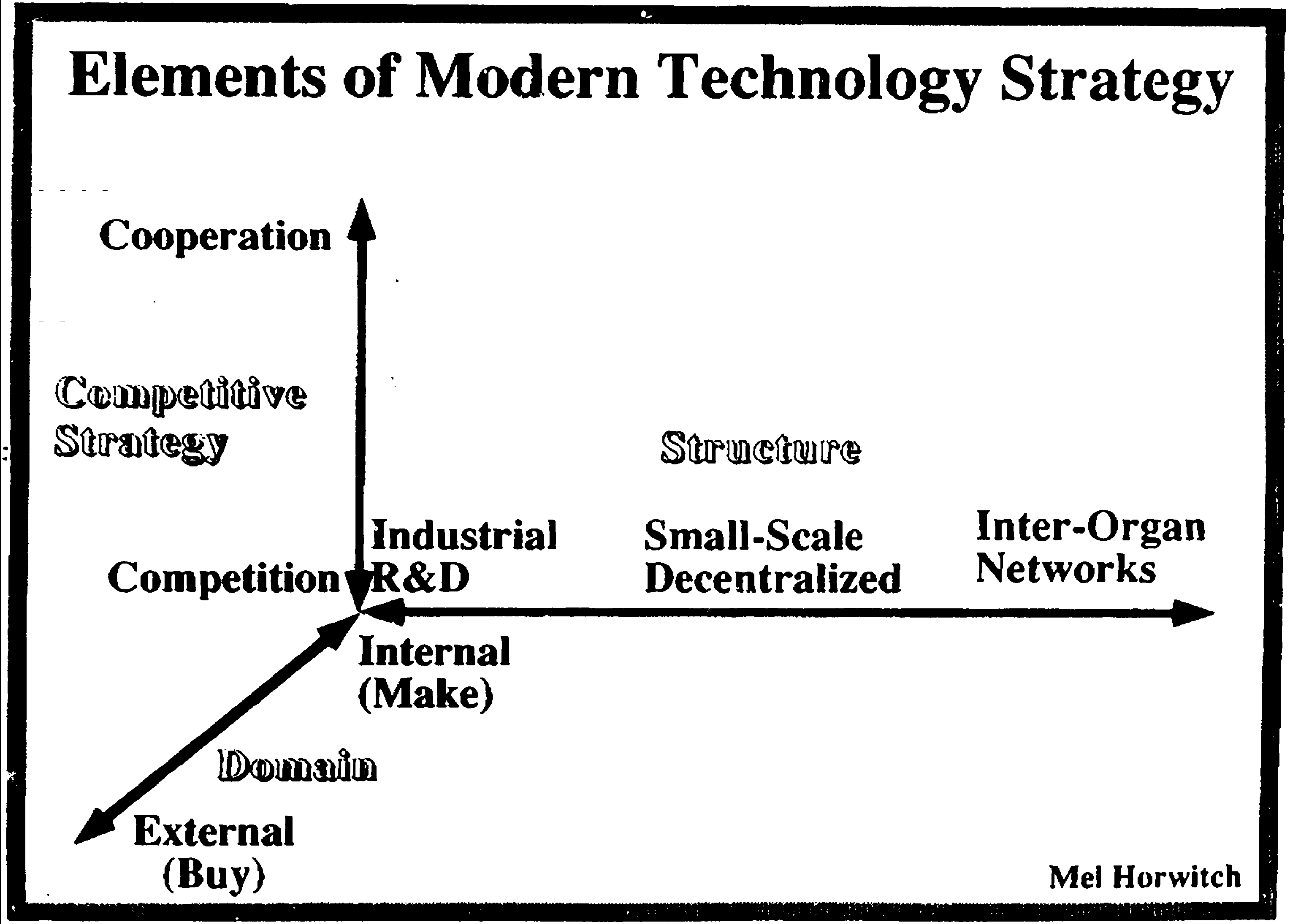

Elements of Modern Technology Strategy
Cooperation
Competitive Strategy
Competition
Structure
Industrial R&D
Small-Scale Decentralized
Inter-Organ Networks
Internal (Make)
Domain
External (Buy)
Mel Horwitch

Figure 2

## Figure 3

## Technology Development and Acquisition Approaches

### Internal

1. Technologies Developed Originally in the Traditional Industrial R D Facilities, Including the Central or Divisional Laboratories.
2. Technologies Developed Using Internal Venturing, Entrepreneurial Subsidiaries, Independent Business Units, etc.

### External

3. Technologies Developed Through External Contracted Research
4. External Acquisitions of Firms for Primarily Technology-Acquisition Purposes
5. As a Licensee for Another Firm's Technology
6. Joint Ventures to Develop Technology
7. Equity Participation in Another Firm to Acquire or Monitor Technology
8. Other Approaches for Technology Development or Acquisition

Journal Index citations and an indepth survey found that for the 1978-83 period there was a substantial increase in the practicing of modern technology strategy methods generally and, especially, in employing non-traditional decentralized structures and in using all the methods identified for external technology acquisition. Companies that have strong inhouse research capabilities have been using, at the same time, more of and a greater variety of internal and external sources for accessing technology, which is a clear illustration of simultaniety in action.

Similar trends can also be seen when viewing technology strategy from the perspective of specific technology-intensive industries. Such practices are increasingly common in a diverse set of technology-intensive sectors, including the personal computer industry, which experienced a prototypical evolutionary development, from a large number of small firms to competition among fewer large players; the permanently turbulent medical diagnostics industry; the restructured manufacturing technology sector; and the immediately strategic biotechnology industry.[8]

To take a specific and startling example, Technology Strategy can even be documented in an industry that does not yet truly exist, the optoelectronic communication switching and computer industry. In fact, the advent of modern Technology Strategy in this industry is probably the most dramatic manifestation of technology's strategic importance. Optoelectronics still consists mostly of intensive R&D efforts by a host of U.S. and foreign firms and some government-sponsored programs. It is still more a vision based on assumptions and extrapolations of technical and market trends. Even without viable and accepted products, however, Technology Strategy is being vigorously practiced.[9]

To pinpoint this industry is a particularly difficult task. The Japanese Optoelectronic Industry and Technology Development Association defined the general optoelectronic field as one "targeted at an effective use of various characteristics of light, such as high frequency, space information processing and phase information processing capability."[10] A leading expert at Bell Laboratories defined the industry as including devices that emit or detect light, rather than using light simply for illumination. The foundation of this industry was the invention of the laser in 1960 at Bell Laboratories. The laser made possible the generation of a pure and strong light signal. Optical technology in theory offers several intriguing potential advantages over traditional electronic technology, having greater "band-width" and speed capacity for the transmission of information, possessing electronic immunity and thereby avoiding electronic tapping or jamming, and employing lighter and smaller transmission media using optical fiber instead of copper. Some of these characteristics have already led to a growing and increasingly commodity-like optical fiber market for long-distance telecommunications and information transmission.

There is also the potential for higher value uses of optical technology in information processing and telecommunications when fused with electronics and related technologies. The use of optics in such a fashion could accelerate the processing rates and capacity in these sectors. Ultimately, optical technology could be used inside telecommunications switching equipment and computers to replace electronic integrated circuits, other semiconductors, and computer wiring. At least in theory, this kind of innovation could lead to mass markets for advanced video and information services and to a huge demand for a host of new products, including optically integrated chips (the so-called "optical chip"), the optical computer, and photonic telecommunication switches. It is this potential sector, defined by the use of optics in electronics, computers, and telecommunications switches--not for solely long-distance transmission, that is emerging as a rich domain for intense high value competition and modern technology strategy practices.

By the late 1970s, the possible application of optoelectronics in computing and telecommunications devices was already recognized. Bell Laboratories was researching integrated optoelectronics; dozens of other U.S. research laboratories were spending a total of about $50 million on optoelectronics; and MITI in Japan established in 1978 a joint $90 million optoelectronic research project with 13 companies. Also, several companies and small firms were exploring segments of this field.

By the mid-1980s, however, the set of industry participants had changed. A dual structure had emerged with three major Japanese computer companies heavily committed to optoelectronics as well as several other firms, mostly small ones, still staking out niches. Figure 4 shows this evolution. In order to understand better this change and the strategic decisions being taken, two important and contrasting firms will be discussed, AT&T and NEC.

AT&T has been the clear leader in optoelectronics research. In 1985, at Bell Labs out of a total of 18,000 employees and 120 laboratories, about 225 scientists and parts of six laboratories (three wholly dedicated) were working on photonics research. At that time, Bell Labs spent a total of about $45 million annually on optoelectronics, $25 million on research and $20 million on development. However, Bell Labs' efforts in optoelectronics are rather unfocused and fragmented, relecting the broad, and science-oriented research tradition of that organization. In 1985, its optoelectronics research budget had 33 percent allocated to lasers, 33 percent to detectors, switches, and bistable optical devices (for optical computing),

Figure 4

Participants in the Optoelectronics Industry

| Type of Institution / Year | 1978 | 1984 |
|---|---|---|
| Integrated Computer or Communications Company | AT&T<br>Bell-Northern Research<br>IBM | AT&T ($33 Billion- Total Sales)<br>NEC ($9 Billion - Total Sales)<br>Fujitsu ($8 Billion - Total Sales) |
| Transmission Systems Supplier or Non-Telecommunications Integrated Company | Hewlett-Packard<br>Texas Instruments<br>RCA<br>ITT | Boeing Electronic Company<br>Sumitomo |
| Vendor | Galileo Electro<br>General Optronics<br>Spectronics<br>Times Fiber<br>Valter | Hitachi<br>Galilco Electro<br>General Optronics<br>Spectronics<br>Times Fiber<br>Valtei |
| Multi-Firm Research Programs | MITI | MITI<br>Battelle Memorial Institute |

Source: Anne T. Fox, Strategic Decision-Making in a Global Technology-Intensive Environment: A Case of the Optoelectronics Industry, Unpublished Master's Thesis, MIT Sloan School of Management. June, 1986, pp. 26-30.

and 33 percent to systems. But, meanwhile, the nature of competition had changed.

NEC is a formidable rival to AT&T in optoelectronics. 10 percent of its sales are invested in R&D (2 percent more than AT&T) with about 10 percent of its R&D budget allocated to optoelectronics, about $50 million in 1985. Optoelectronics R&D has grown about 10 percent annually since 1980. Optoelectronics R&D at NEC is consciously structured according to three categories: basic research, device research, and applications research. Research activities are given priorities within each category. Applied research is linked closely to production and marketing. NEC is already committed to produce efficiently small optoelectronics devices and is scheduled to dedicate a plant in 1988 that will produce optoelectronic devices, the first plant of its kind in the world. Clearly, NEC is much more explicitly strategic, coordinated, and integrated in its commitment to optoelectronics than AT&T.

Other Japanese firms are also strongly involved in developing an optoelectronics capability, including the computer company Fujitsu, which has a general strategy of entering the high growth segments of telecommunications, and the cable firm Sumitomo, which is a leading producer of optical fiber and semiconductors. This company has also made a strong commitment to optoelectronics as part of its overall strategy to move into high-technology and international markets. Sumitomo is targeting high value components like optoelectronics modules. In the U.S., Boeing also has R&D activity in optoelectronics. The firm established the Boeing Electronics Company in 1985, as part of its strategy to diversify somewhat out of aerospace. In 1986, Boeing also created an optoelectronic research laboratory in its High Technology Center. This laboratory has received about $20 million in funding or about 20 percent of the Center's total budget (which, in turn, represents about 25 percent of Boeing's overall R&D allocation). Boeing's activities are more focused than either AT&T or NEC.

It is extremely hazardous to perform an assessment of the corporate strategies in this industry, where practically no truly significant products have been marketed. Still, certain trends and evaluations can be done. As seen in Figure 5, one comprehensive analysis of this industry concluded that both NEC and Fujitsu would maintain their high strategic position during the next decade, that Sumitomo and Boeing would improve moderately, and that AT&T would decline somewhat in relative strategic position due especially to its lack of explicit priority-setting within optoelectronics and the absence of strategic coordination and integration. Clearly, AT&T has excellent technology but not necessarily superior Technology Strategy.

Multi-firm activities are also an important aspect of the optoelectronics industry. In Japan, the nine-year, $90-million MITI joint research program on optical measurement and control systems, which started in 1979, still exists with 13 companies participating. In 1981, MITI also formed the

## Figure 5

### Strategic Position of Major Optoelectronics Firms

| Company | 1986 | 1995 |
|---|---|---|
| AT&T | High | Medium |
| NEC | High | High |
| Fujitsu | High | High |
| Sumintomo | Low | Medium-Low |
| Boeing | Low | Medium-Low |

Source: Anne T. Fox, Strategic Decision-Making in a Global Technology-Intensive Environment: A Case of the Optoelectronics Industry, Unpublished Master's Thesis, MIT Sloan School of Management. June, 1986, pp. 94.

Optoelectronics Joint Research Laboratory to conduct basic research on optoelectronics devices for short-haul uses. MITI is also funding optoelectronics R&D at NEC, Fujitsu, Hitachi, Toshiba, and Mitsubishi. These firms, along with Sumitomo and three others, are also participating in the MITI optoelectronics laboratory. NEC is working with several Japanese materials and chemical firms and a U.S. firm on optoelectronics R&D. In the U.S., an optoelectronics research consortia was established by Battelle Memorial Institute in 1985 and had seven corporate sponsors, Boeing, Hewlett-Packard, ITT, Allied, Litton, AMP, and Dukane. Each firm contributed $600,000 for three years of research. Battelle ideally is aiming for 16 corporate members and a $12 million program. The U.S. Department of Defense also funded $20 million for optoelectronic research in 1985.

The remarkable aspect of the optoelectronic communication switching and computer industry is how strategic it is even before there are significant products on the market. A massive long-term R&D commitment is in place, a global perspective dominates, evaluations of long-term strategic capabilities and advantages are carried out, and a web of new linkages already exists. Amazingly, explicit Technology Strategy has preceded the actual establishment of an ongoing industry.

Among the general lessons to be derived from a discussion of comparative Technology Strategy patterns at the industry level are, first, that a similar pattern of strategic decision making seems to have emerged, mostly without regard to the specific technology-intensive industry. Technology itself has become an increasingly important strategic concern in stereotypically high-tech sectors like personal computers, ultrasound medical diagnostic equipment, biotechnology, and optoelectronics and in seemingly mature industries like manufacturing technology. In addition, there is also clear evidence of the coexistence of multiple internal structures (such as industrial R&D and venturing), of large and small firms, of multi-firm research efforts, and of new kinds of linkages in all of these industries, whether they are established (like manufacturing technology, personal computers, and ultrasound), new (like biotechnology), or not yet truly in place (like optoelectronics). Moreover, Technology Strategy methods are obviously being vigorously practiced on a global basis, particularly in the advanced economies. Finally, all these lessons point to a more general implication that such practices are similarly not limited to either a small set of industries or countries.

The global character of Technology Strategy can also be discerned by studying specific representative firms. One increasingly significant feature exhibited by many of these companies is the growing importance of diverse kinds of strategic alliances and interorganizational relationships, termed value creation networks, for the purpose of gaining access to needed technology.

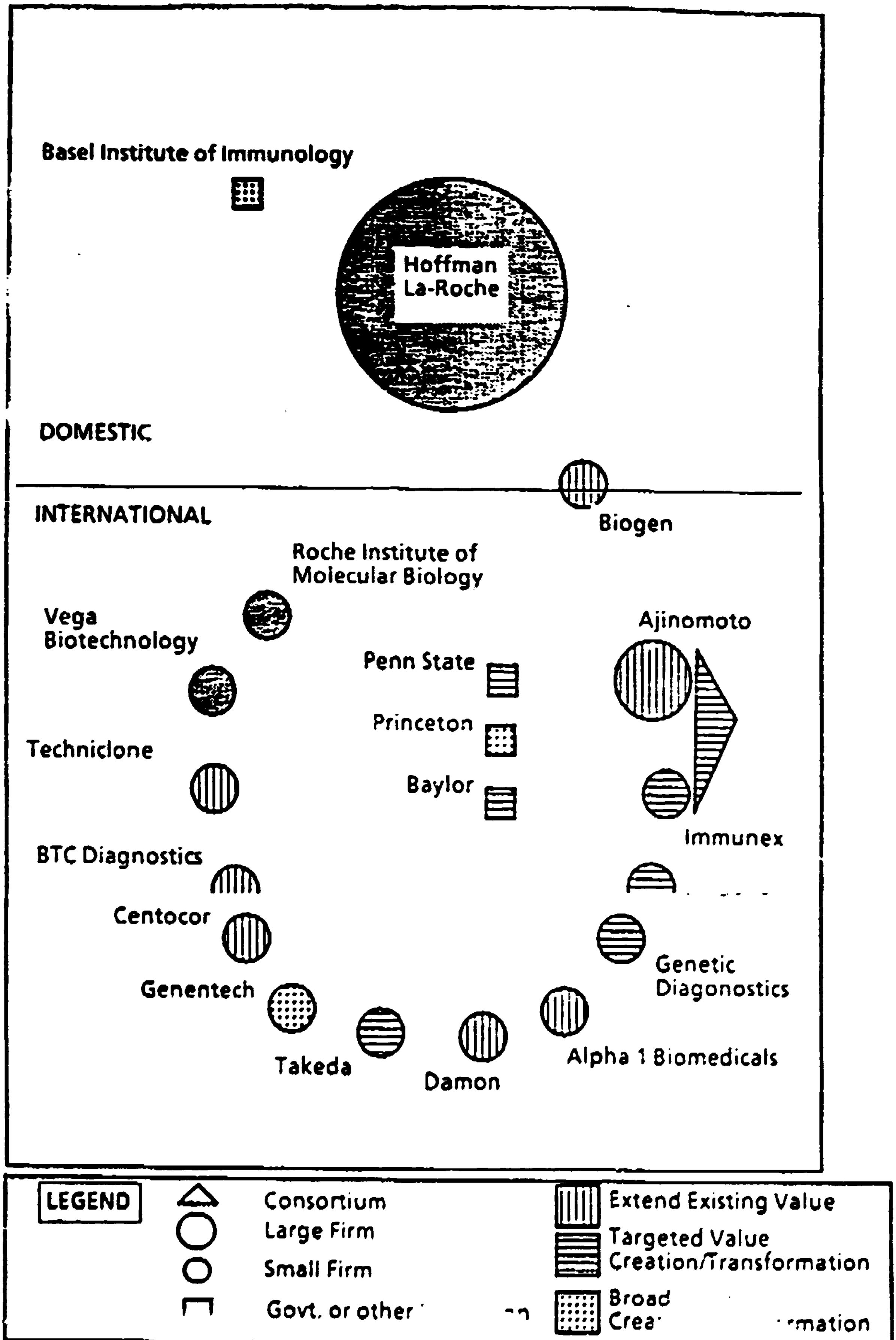
The prevalence of strategic alliances on a global basis can be demonstrated by briefly reviewing the strategic configuration established by three representative technology-intensive large corporations: the linkages with a biotechnology focus of the Swiss-based pharmaceutical company, Hoffmann La-Roche; selected strategic alliances formed by the Japanese electronics giant, NEC; and the constellation of external relationships established by the U.S. automobile maker, General Motors.

The modern interorganizational structures associated with these three firms are presented in Figures 6 through 8. As can be seen, similar patterns of strategic linkages have occurred in spite of the fact that these firms possess different histories, cultures, and national origins and that they compete in industries with substantively different characteristics. All three firms are now clearly at the center of a hub of a vast and complex network of relationships.

The functions of these networks are clearly multiple. They include simply extending value for ongoing business activity and, increasingly, creating new value or radically transforming current value. Also, it is worth mentioning that the kinds of participants in these webs of linkages are extremely diverse. Large firms, small firms, multi-firm consortia, and governmental agencies or programs are all represented.

**Figure 6**

**Hoffmann-La Roche: Selected Linkages With Biotechnology Focus**



## NEC - New Linkages: Selected Examples (1980-1985)

**Figure 7**

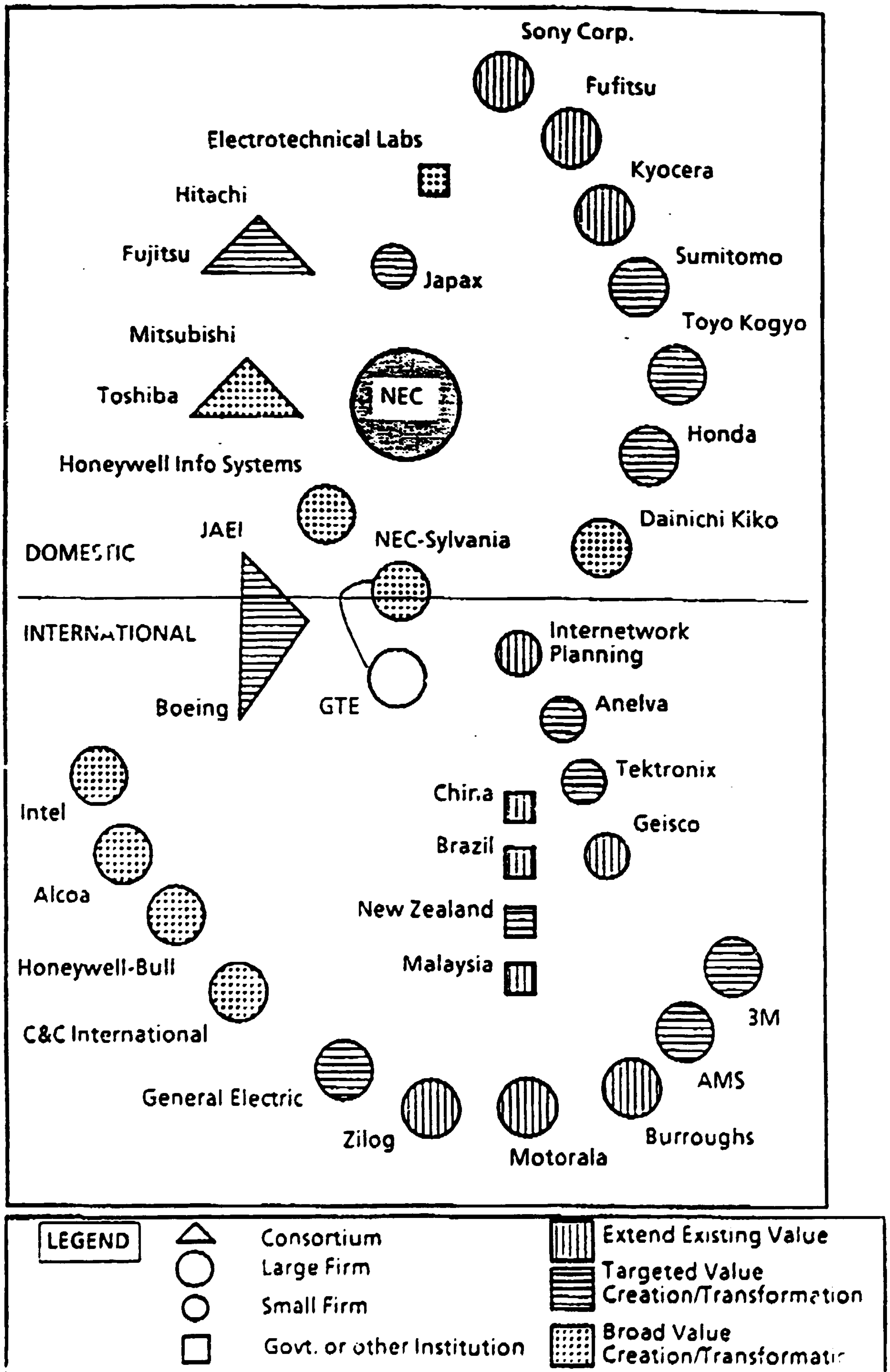
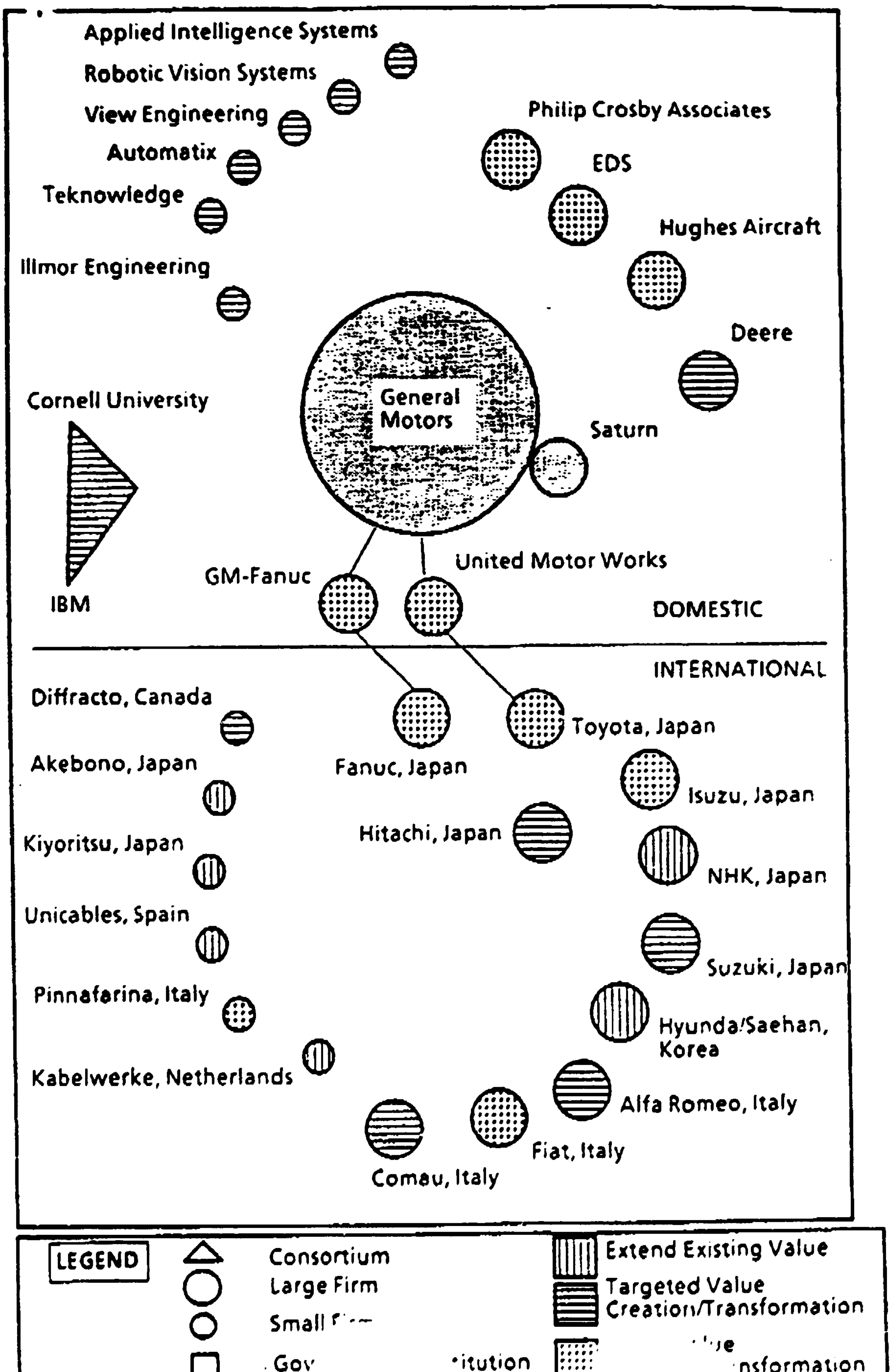


Figure 8

General-Motors: Selected New Linkages With Technology Focus 1980-1985



The actual types of linkages identified are also quite varied. They include licensing agreements, marketing or research contracts, acquisition, and minority equity holdings. With regard to this last type of linkage, for example, it is clear from Figure 8 that General Motors has a strategy of using a portfolio of minority equity investments at least partially to keep abreast of technological developments in such fields as vision systems, artificial intelligence, and expert systems.

Finally, it is obvious that these interorganizational relationships often cut across international boundaries and some of these linkages are truly global in scope. Hoffmann La-Roche has biotechnology-related agreements with three U.S. universities. NEC has ties with several U.S. firms and foreign governmental bodies. General Motor has foreign joint ventures with technology development objectives. GM's partners include Fanuc, Isuzu, Alfa Romeo, and Toyota.

These remarkably similar patterns of strategic-alliance structures by such different corporations as Hoffmann La-Roche, NEC, and General Motors are not simply due to coincidence. Instead, they indicate a kind of convergence in the practice of Technology Strategy by technology-intensive corporations. Many such firms are intensively searching for effective higher value strategies, which often involves considering technology as the critical strategic variable. Increasingly, firms are willing to "buy" such value creating capability as well as investing in an internal capability to "make" high value creation.

## III. Generalizing: Technology Strategy and the the Value-Creating Post-Modern Corporation

A major implication of Technology Strategy, particuluarly with its penchant for both novel anti-hierarchical forms within the firm and for interorganizational linkages outside, is that it signifies the emergence of at least partially a new corporate form.

What might be the configuration of this quasi-new entity? It is not simply a rational hierarchical institution, which was documented by Chandler and which was a supportive home for strategic planning methods.[11] Nor is it the smaller, flatter, and more informal organization and style of either the General Management school or high-technology entrepreneurialism.[12] Instead, it possesses features of both-- with decentralized smaller units and continuing large-scale hierarchies, divisions, and functions.

In addition, a major part of such a corporation's strategic repertoire is a diverse set of external relationships that are established for the purpose of capturing still more value. In particular, the employment of interorganizational collaborative value creation networks are a key distinguishing feature of the strategic behavior of the corporation practicing Technology Strategy today. Such moves can be viewed as essentially attempts to establish pipelines to outside resources that can enhance the value creation capability of an enterprise. The various types of linkages can be delineated in Figure 9, and it is argued that the emphasis is shifting to the second and third columns where the creation of value is largely occurring.

The emerging Post-Modern corporate form, which is using Technology Strategy to access innovative capabilities continually, can be modeled in order to facilitate a generic understanding of this increasingly signiifcant new kind of corporate institution. Figure 10 presents a model that represents how such a corporation might be structured within and might establish linkages outside in order to access innovative capabilities, including technology.

This model is instructive in several ways. First, from the perspective of the large firm, A, a vast number of different options are possible and several types of linkages are established. This firm has alliances with another large firm, B, several small firms, D, a large foreign firm, C, and a small foreign firm, E. It also has a strong association with an industry-wide consortium for technology development and a government-sponsored multi-firm R&D program. Moreover, the strength of these linkages is by no means uniform. Some of the relationships are quite strong, that is, they are relatively durable, difficult to break, and may be legally bound to last for a definite period or until some goal is achieved. Other relationships are quite easy to break, that is they can be quickly eliminated at almost any time, say, by selling stock or withdrawing funds arbitrarily. Many of these links are switchable, in the sense that they can be turned off and possibly

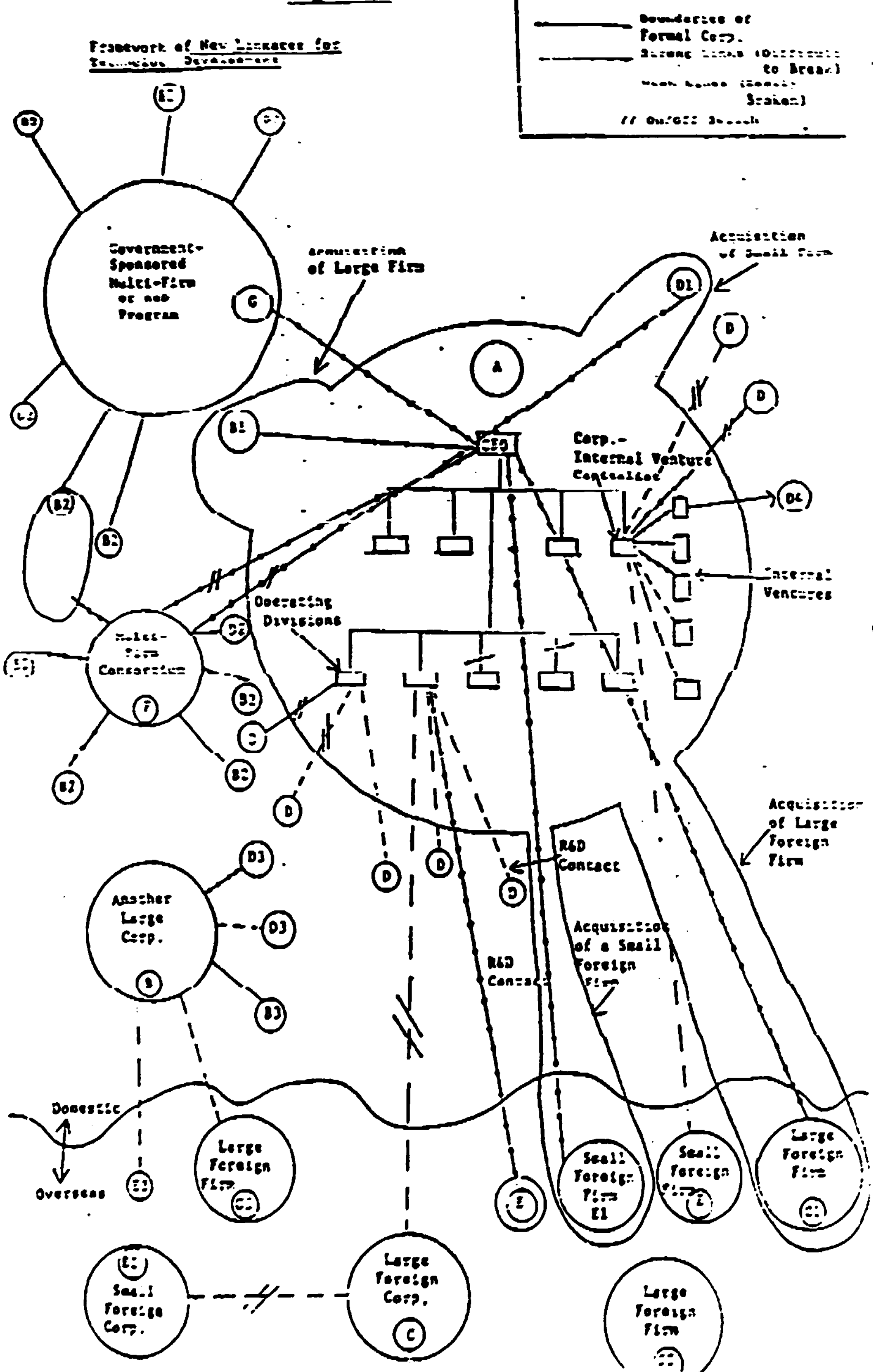
## Figure 9

## Alternative External Collaborative Arrangements

## Possible for the Large Corporation

| | Strategic Objective of Large Corporation | | |
|---|---|---|---|
| Type of Partners/ Sponsor Chosen | Extension of Established Value | Creation or Transformation of Narrow or Targeted Value | Creation or Transformation of Broad Value |
| Another Large Corporation | Licensing<br>Joint Venture for Manufacturing or Marketing | Joint Venture for New Product Development or New Manufacturing Methods | Joint Venture for New Sector Development |
| Small Firm | Distributor for Limited Market | Contracted Research<br>Joint Venture for New Product Development | Portfolio of Minority Equity Positions in Selected Small Firms |
| Multiple Firms | | | Multi-Firm Consortia |
| Government Programs | | Governmental Research Program | Governmental Research Program |
| Others | | University-Industry Association | University-Industry Association |

**Figure 10**


Formal Corp.
to Break)
Broken)
Government-
Sponsored
Multi-Firm
Program
of Large Firm
Acquisition
Corp.-
Internal Venture
Internal
Ventures
Operating
Divisions
Consortium
R&D
Contact
Acquisition
of Large
Foreign
Firm
Another
Large
Corp.
Acquisition
of a Small
Foreign
Domestic
Overseas
Large
Foreign
Small
Foreign
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E1
Large
Foreign
Corp.
Foreign
Corp.
Large
Foreign
Firm

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turned on again. Notice also that this situation is global; the linkages are not simply limited to the domestic setting. In fact, firm A has R&D being done overseas by firm E. Notice also that another large firm, B, with which A maintains a weak tie, has its own set of linkages with firms at home and abroad that are large and small, D3, B3, C3, and E3.

These linkages may be controlled on monitored from different points within the formal internal organization of firm A, such as the CEO's office, the internal venture unit, or one of the operating divisions. Any one of these places may have linkages with outside firms, though it is likely that high-level corporate or division managers control the linkages with the industry-wide consortium or the government-sponsored program. The formal internal organization itself is changing as a result of these linkages. Figure 10 shows how the boundaries can be stretched. Firm A has just acquired large domestic firm B1, small domestic firm D1, large foreign firm C1, and small foreign firm E1. Before the acquisitions firm A may have maintained other kinds of linkages with some of these companies. The opposite can also happen. Small firm D4 was once an internal venture that had incubated solely within firm A. Firm A decided to spin off this venture and just keep a piece of it.

In reality, Figure 10 portrays a flexible and malleable network of weak and strong relationships that may override the formal organizational boundaries of the firm. The job of strategy has changed. Previously the emphasis was on recognizing the opportunities and threats in the competitive environment and establishing within the firm the appropriate structure, systems, and processes. With the increasing importance of strategic networks, which have associations that pierce through the formal boundaries of a firm, the tasks of scanning, facilitating, and coordinating external entities assumes greater significance. In addition, the old make-vs-buy tradeoff, found originally in purchasing and manufacturing, takes on greater general meaning. The creation of strategic networks can encourage a policy in which external entities play a higher value strategic role, and the notion of shrinking or "de-massing" the internal structure gains enhanced legitimacy.

To repeat, as we have seen, both novel internal structures and external value-creation strategic alliances, which make up much of sophisticated Technology Strategy today, are part of the broader transition toward Post-Modern Strategy that is now underway. This development requires a significant change of views concerning the fundamental conceptualization of strategic management. Defining the domain of corporations is no longer simple. The inside structure is quite complex. The outside environment is no longer merely competitive. The distinction and boundaries between organization and environment are blurred. There are now a variety of ways to join forces with external actors. At least some of the linkages themselves can be changed or cancelled. The growing diversity of enterprise certainly presents new difficulties for strategic managers. But it also can mean enhanced strategic degrees of freedom and choice. The rising strategic importance for firms of constantly acquiring innovative capabilities means that now there are new paths available for achieving meaningful strategic success.

## ENDNOTES

1. For technology as a strategic variable, see: John Friar and Mel Horwitch, "The Emergence of Technology Strategy," Technology in Society, Vol. VII, Nos. 2/3 (Winter, 1985/86).

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