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**Technology and Global Strategies and  
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**CEO Publication  
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## ABSTRACT

In this paper technology is viewed as a pervasive force bringing about today's global competition. Technology's effects on the role of governments, business strategies and new organizations are discussed. Companies are seen as moving from a period of recovery of competitiveness to development of new sources of revenue. The organizations that are relevant to these strategic changes are matrix types, the network organization and neo-conglomerates. The network organization is described in detail.



## TECHNOLOGY AND GLOBAL STRATEGIES AND ORGANIZATIONS

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Technology acting directly and indirectly is the most powerful shaper of global strategies and organizations today. Gerald Hage identifies 1975 as the year of the beginning of the new competitive era (Hage, 1987). In that year, R&D spending increased 6% in real dollars over previous years. Every year since then U.S. firms have increased real spending from 4.5% to 8% per year. Through the compounding effects of percentage increases, the U.S. in 1988 will spend twice as much in real dollars on R&D than it did in 1975. Abeggelen reports that Japanese firms have increased real R&D spending 17% per year since 1978 (Abeggelen and Stalk, 1985). The ramifications of the increase in resources devoted to technology are to drastically alter the nature of competition, the role of governments, the types of business strategies and therefore the kind of social organization needed to conduct economic activity today and in the future.

This chapter traces the effects of the new technological competition on the business environment through to its effects on new organization forms. The first section discusses the environment with its direct and indirect effects of technology. The second section discusses how businesses are adopting strategies to deal with the new environment. Finally the organization forms, some new and some old, that will be used are

described. The table below illustrates the factors that make up the environment, the strategies and the organization forms. Overlays and network organizations will be discussed in this chapter.

**TABLE I**  
**FRAMEWORK FOR ANALYSIS**

<u>ENVIRONMENT</u>	<u>STRATEGIES</u>	<u>ORGANIZATIONS</u>
Technology	Recovery of the Core Business	Overlays
Over Supply		Networks
New Competitors	Extension of Core to Global Reach	Neo-Conglomerate
New Government Role	Development of New Business	Clean Sheet Start-up
Deregulation		
Take Overs		

**BUSINESS ENVIRONMENT**

Technology has a direct effect on business strategies but also has an indirect effect on other factors such as the role of governments. In this section, the factors in the environment that are shaping the new business strategies are identified and described. In combination they increase the number and quality of competitors pursuing a slower growing global market. Collectively they constitute the forces in the new global competition.

## Technology

The statistics quoted earlier on rates of growth in investment in R&D, indicate that U.S. companies double their investments in R&D every ten to twelve years. Japanese companies are doubling theirs every five to six years. These investments greatly increase the fixed costs of doing business. In order to cover the increased costs of product and process development, companies need volume greater than that provided by their domestic home markets. This search for world scale volumes has greatly increased the level of competition in most markets.

The increased investments also are shortening product life cycles. With fewer years over which to write-off the product development costs, companies need more volume per year, in order to reach break even points. The result is a search for markets in more countries to replace fewer years of volume. The level of competition increases even more. Thus the immediate effect of investing in new technologies is to escalate global competition by forcing companies to seek world scale outside their domestic markets.

## Over-Supply

The problem with more firms seeking world-wide volume is that world-wide demand is not growing fast enough to accommodate them. The U.S. is no longer a source of growth as it deals with its twin deficits. Europe has grown at less than 2% per year over the last ten years. The West Germans, ever fearful of inflation, are reluctant to stimulate their economy and act as a



source of growth. The lesser developed countries have demand but not much foreign exchange to pay for anything. The Pacific Rim countries are growing but have not yet opened their markets to foreign goods. The result is more competition for less growth.

### New Competitors

The new competitors are largely companies from Pacific Rim countries. They need not be described here (Kotler, Fahey and Jatusripitak, 1985). Suffice it say that they are all following the Japanese model and moving from labor cost advantages to world scale plants to proprietary technologies for competitive advantage. The result is that the world has more and more effective suppliers of its products. The level of competition goes up another level with these more effective competitors.

### New Role for Government

One reason that the new competitors are quite formidable is that they are teamed with their governments. Government has always been active in international trade but the nature of its interventions has changed. Initially, government regulated trade through tariffs and subsidies. Most trade was in raw materials and commodities. Now trade has expanded to include industrial and consumer products. These products are manufactured and distributed by multi-national oligopolies. It is more efficient for countries to negotiate directly with IBM, Sony and Siemens to get local value added. So governments have shifted from regulation of markets to direct negotiation with oligopolies.

The most recent change, however, is to the active actual participation of government in the competitive process. Technology is again a driver of this change. The new role is clearest in newly emerging industries and technologies. Governments shelter new industries like bio-technology. They also relax anti-trust laws permitting cooperation among local competitors in developing new technologies at pre-competitive development stages. That is, governments are increasingly forming and funding consortia and non-profit corporations to create and disseminate new technologies before they are developed into commercial products. For example, the European Community has funded ESPIRIT to develop semiconductor and electronic products.

A scan of the Business Week issue for September 19, 1988 indicates this new role in the U.S. First the Federal Communications Commission is setting standards for introducing high definition television (HDTV). Among other features, the standards limit the Japanese and provide American companies, if any are interested, with a window of opportunity to catch up. Second, the National Research Council is concerned about progress in photonics and proposes a national effort. The National Photonics program is to fund companies, government laboratories and universities in a cooperative program. Third, Japan refuses to open its research on superconductors at its universities. The U.S. has complained and is launching a bill through Congress for a five year, \$600 million program. It is to support Superchip Corporation, which is to work on superconducting chips, and

Superconductivity Applications, Inc. which is to work on wire and electrical applications.

The effect of this most recent shift in government role is to shift the basis of competition more to country vs. country rather than company vs. company. The inter-company competition remains in the markets. But trade blocs are more active in promoting technology for their local competitors.

### Deregulation

Another feature of today's environment which increases competition is deregulation in financial, telecommunications, media, transportation and other markets. These moves are often the direct result of technology and investment levels in new technology. Communications technologies, for example, move money in the form of bits around the world instantaneously. The biggest change is taking place in Europe. In 1992, all of the non-tariff barriers to competition are to be eliminated. The actual dismantling of all barriers will take longer. But many changes are occurring already in anticipation of 1992. Europe is becoming a much more competitive marketplace.

### Takeovers

The increased level of competition requires strategies from management to deal with the new environment. The stock markets undervalue the stocks of companies that do not respond. In the less regulated financial markets, investors both friendly and unfriendly have bid to take over these undervalued stocks. If

management needs an additional stimulus to respond to the new competitive environment, the takeovers are providing it.

### Summary

The middle 1970's produced the start of the new global competition. It was then that investment in R & D and the rise of new competitors from the Pacific Rim created an excess of supply in most industries. In this new competitive arena governments are both deregulating some markets and actively participating in pre-competitive phases of new industries. The more competitive markets and global deregulated financial markets are imposing strict disciplines on managements. New strategies and new organizations are the result.

### THE NEW STRATEGIES

The response of western companies to the new competitive environment has been a sequence of three strategic steps. First, they act to recover the cost and quality competitiveness of their core businesses. Next they extend these businesses on a global basis. Finally, the priority shifts to the development of new sources of revenues. The companies still work on cost competitiveness and global extensions but growth and development assume a higher priority in resource allocation when the business generates an excess cash flow. Technology plays a different but key role in each of the three strategies.

## Recovery

The new competition had its beginnings in the mid and late 1970's but the first strategic response to it came in the early 1980's. Western companies faced deeply depressed earnings caused jointly by the recession of 1981-82 and the new competition. Companies from the U.S. experienced the highly inflated dollar as well. During this era the massive recovery efforts on the core businesses began. These efforts have progressed from cuts and layoffs to longer term programs shown in Table II below. Today firms are relying on responsive integration, consolidation, vertical disintegration and employee involvement.

Table II

### Recovery Steps

- Cuts, Quality and Capital
- Responsive Integration
- Consolidation
- Vertical Disintegration
- Employee Involvement

Initial efforts centered on cuts. These came in spending, layoffs, plant closures, concessions, fewer staff, early retirement and so on. Everyone downsized. These efforts dropped break even points so that firms could survive a recession but they did not restore competitiveness.

Today, recovery efforts are centered on longer term areas. Quality programs are being implemented throughout organizations

and Vice Presidents of Total Quality Management report to the CEO. Chief Financial Officers conduct a world-wide search for capital as U.S. interest rates increase the cost of money.

Technology comes into play in several ways. In automation, technology is used for reducing labor cost. It is used in robotics and automation for quality and flexibility. Management and professional functions are now being automated by computer aided design (CAD), engineering (CAE), manufacturing (CAM), software engineering (CASE), and so on. Currently, the establishment of computer to computer linkages is reducing intermediate information processing steps in sequential processes with a reduction of clerical costs and an increase in quality. The computer's greatest impact on management processes is that it facilitates a more responsive and integrated organization.

The responsive-integration efforts of firms are a direct response to the new competition. Many companies are discovering that there are hidden costs in the interfaces between functions like engineering and manufacturing or sales and manufacturing. Engineers were previously unconcerned or unaware that trivial design changes could produce major savings in manufacturing costs. Development costs can be drastically reduced if new products are brought to market faster. The faster more integrated development processes are called "Simultaneous Engineering" in Detroit or "Concurrent Design" at Hewlett-Packard. Now responsive integration is a basis of competition. Firms are designing quality and cost effectiveness into their products and services from the beginning. As product life cycles

are declining, the product development cycles are declining. The customer is also demanding more customized products, faster delivery and newer technologies. The firms have to provide customized responses, integrated responses and faster responses to stay competitive.

A second strategic change is consolidation. A number of factors are causing firms to consolidate, pool and centralize activities that require specialists, use expensive equipment and require large expenditures on R&D. When companies want to minimize the number of people, they create a central pool and time share them. Various staff and specialist organizations are being consolidated. In order to stay at the state-of-the-art and afford expensive equipment, research activities in an area are being consolidated in "Centers of Excellence" or in other similar units.

Consolidations are also occurring across companies through acquisitions and mergers. A number of mergers were attempted in the pharmaceutical industry. Achieving scale in R&D is always a factor in these acquisitions. Unisys, after merging Burroughs and Sperry is again looking for other acquisitions to get the scale to develop and deliver today's computer technologies. Similarly mergers among Europe's national champions in the computer business are being discussed. Scale is needed in computers to combat IBM, DEC, Fujitsu and Hitachi and capitalize on 1992. So the increased level of spending on R&D and on automated plants and processes is causing consolidation to achieve the scale needed to cover higher break even points.

Technology is also a powerful factor in the next recovery technique -- vertical disintegration. Previously, high performing companies did everything themselves. In order to insure high quality supplies and guaranteed outlets for their products companies performed all activities in the value added chain. This policy led to extensive vertical integration managed by monolithic hierarchies like General Motors and IBM. But in today's competitive environment companies can no longer afford to do everything. Nor can they do everything well. Companies are therefore doing only what they do well. At the limit, companies perform only those activities in which they hold a competitive advantage. The remaining activities are sought from sources outside the firm. In a competitive environment, a company cannot afford a second rate performance in any activity. If its own performance is not competitive, then the firm must buy from someone who is.

However the same forces for vertical integration still exist. That is, firms still need a guaranteed source of supply. However companies do not have to own all the suppliers to receive the guarantee. They create sourcing relationships, alliances (teaming), minority investments, joint ventures and join the government sponsored consortia referred to earlier.

Firms in the paper industry are an example. Not typically considered high technology, paper is becoming R & D intensive. Previously paper companies vertically integrated all the way from owning forests to making pulp, paper and converting paper into products such as packaging. Today the packaging revolution has



increased R&D expenditures for new products. Process control computing has increased R&D in process innovation. Bio-technology is causing land and timber companies to invest in R&D to create super-trees which grow to maturity in fewer years. Very few companies can afford all of this R & D investment. Fewer still are good at all the different types of R&D. In response to more R & D spending, various supply and technological exchange arrangements are occurring in the industry. Some are simple vertical disintegration where a subsidiary which supplied the company is sold to a vendor who is consolidating. Long term supply contracts and/or minority investments by the previous owners are used to guarantee a source of supply.

The newer arrangements are those that exist between competitors. For example an alliance between Toshiba and Motorola is to exchange technology. Motorola will provide micro-processor technology and Toshiba will provide dynamic RAM (Random Access Memory) process technology. The firms will continue to compete in the market place. McDonnell Aircraft and General Dynamics are teaming together in a bid for the Advanced Tactical Aircraft (ATA). Neither can afford the risk of the investment nor to stay in all technologies. These are not the usual contracting/sub-contracting relations. There is greater sharing of data and cooperation between competitors who are both system integrators.

Finally, competitors are coalescing, with government encouragement and sponsorships, into consortia of various kinds. The government sanctions the collusion between competitors in pre-competitive phases of technology development. Often the

government provides funding and opens national laboratories. More recently, serious discussions in the U.S. are revolving around having the Department of Defense pick technological winners and fund their development like the Japanese ministries have done. At the moment it is not clear how successful these cooperative efforts are going to be. But they are all being caused by the new technological competition.

In summary, firms are acting to restore competitiveness in their core businesses in a number of ways. Initial efforts at downsizing through cuts give way to programs to consolidate activities, to increase integration and responsiveness, to automate all activities, and to disaggregate by buying more activities outside the company. The final phase in this process begins by recognizing that recovery is a never ending process. At this point companies begin programs for employee involvement to launch a process of continuous improvement. Everyone in the company takes responsibility for improving cost and quality performance.

The overall effect of the recovery efforts is to create paradoxes for the organization. Companies must be more competitive and more cooperative. They must now fight harder for market share and profits. Yet they must cooperate more, even with competitors, to share expensive technologies so that all benefit. Technology itself creates paradox. Work stations with the power of mainframes, microprocessors embedded in everything, and flexible manufacturing all reduce scale economies and enhance the competitiveness of small firms. On the other hand, the next

central office switch will cost billions. Semiconductor plants cost hundreds of millions because of the sophisticated technologies in them. Costs such as these favor large firms. Responsive integration favors small fast acting units. Consolidation and pooling encourage large firms. The challenge for organizing is to design social systems which are viable in the face of the paradoxes.

### Extend the Core Business to a Global Business

The next steps that companies are taking are to make their core businesses into global businesses. No longer can international business strategy be the sum of the country or regional strategies of subsidiaries. Business unit strategies must be more global from the outset. However, there are differences in the degree to which a business is a global business. Similarly countries vary in their degree of participation in the economic process. As a result, subsidiaries vary in the degree to which they can be localized and business units vary in the degree to which they are global.

The degree to which a business is global depends on the structure of the industry in which the business is conducted (Doz and Prahalad, 1987). One of the determinants of industry structure is the percentage of sales invested in R&D. A consumer goods business investing 0.5% of sales in R&D is not a global business. While in pharmaceuticals, electronics and biotechnology, where 12-15% of sales go to R&D, world scale is needed to cover the fixed costs of product development. In industries requiring world-scale, products need to be designed

from the beginning to be capable of sales in multiple countries. Hewlett-Packard cannot afford to design a U.S. personal computer, a European personal computer and a third one for the Far East. Instead they design a common platform with a capability for localization later. The same process occurs at Allen-Bradely for its factory automation products. The basic product is designed from the beginning to be capable of modification to fit multiple markets.

Investment in state-of-the-art factories also increases fixed costs and causes a search for world scale volume. Businesses such as semiconductors, auto components and processing industries all have heavy investments in factories. As distribution and service businesses invest in computer hardware, software, and networks, their capital costs increase. Many businesses with increasing fixed costs are becoming more global in order to achieve world scale. In order to achieve this world scale, companies need a product development process which integrates multi-market needs and coordinates multi-site efforts.

Other factors also determine the degree to which the structure of a business is global. One factor is whether competitors and customers are also global in their businesses. Another is the degree to which markets are homogeneous across countries. Homogeneity allows more universal products and fewer tradeoffs when pooling international market requirements.

In summary, a number of factors determine whether a business is a global business. One of the key parameters is the percentage of sales that is invested in R&D. In order to get the volume to cover higher break even points, the business must seek

world scale and become global. For almost all high technology businesses, more increased investment in product development is requiring global product strategies and more universality in their product lines. No longer can products be designed for the U.S. market only. World-wide marketing strategies for determining world-wide needs are being implemented.

Along with forces that are making for more globalization and integration across countries, there are forces causing more fragmentation of activities and tailoring of policies to individual countries. The international strategy area has its paradox also. As host governments become more active, especially in high technology industries, they are forcing businesses to become more locally attuned and to add value in their country. In order to get access to markets and attain world scale, companies must accommodate to the countries' demands for technology transfer, value added in their country or a joint venture with a local partner. Companies also need to compete where the cutting edge technology gets introduced first. Increasingly high technology products are being introduced simultaneously all over the world. But products like television sets are introduced in Japan first while software is introduced in the U.S. first. For competitive intelligence, companies must be in these markets. Other companies are seeking to do development in a variety of countries and to capture unique national competencies in the process. Organizations are locating design activities in northern Italy, manufacturing research in

Japan, R&D in Israel (one of the few countries without a shortage of electrical engineers) to name a few examples.

These last forces tend to fragment an organization and scatter activities around the world. These forces act in contradiction to the forces for integration. Like the forces experienced in recovery, globalization creates both strong and conflicting pressures for organizations. They must integrate global business strategies and yet fragment the actual performance of the work in a variety of countries. They must also demonstrate that they are good local citizens as well.

Telecommunications is a good example. The next central office switch will be a multi-billion dollar effort. Only a few switches can be designed and yet generate enough sales to exceed break even points. The switch designers need world scale and a fairly universal product base from which to adapt to local markets. However switches are purchased by government owned Post Office-Telegraph and Telephone Ministries who insist on buying local. In order to get the business, AT&T, NEC or Siemens will have to be local and global simultaneously. Organization design for strategy implementation under these conditions becomes a challenge.

### Development

Strategic priorities for technology firms are now shifting and will be different in the 1990's. There will continue to be recovery pressures on costs and quality. There will continue to be pressures to think globally about the businesses. But

development has already begun to assume a higher priority in resource allocation decisions. At some companies the new expression is "What are you doing for the top line?" That is, companies realize that they cannot stay competitive by simply closing plants and offering early retirement. They need new sources of revenue in order to grow and develop. Also the revived core businesses are generating more cash than can economically be reinvested in them. Leaders are now being challenged to search for new growth sources.

The new development strategies being adopted by western organizations are targeting services, software, technology and financial services as new growth sources. There are a number of reasons for their selection. First these industries are the growth areas for western economies. In a growth market, the competition for marketshare is less fierce and profit margins higher. Second, many organizations already perform the services, generate software or create technology for their own internal needs and discover that they are good at the activity. A business can be built from these internal seeds. Third, many industries in these areas are restructuring because of technological change and/or deregulation. The newcomer has an advantage in an industry undergoing restructuring. Current industry participants are invested in the old technology and slower to adopt the new rules of competition. Financial services is the best example of an industry that is restructuring because of technology and deregulation. Many of the largest and most profitable financial

service businesses are the former credit subsidiaries of General Electric and IBM.

The high technology businesses are targeted as new growth sources for several reasons in addition to those mentioned above. First, western countries with trained and expensive work forces can best compete in the high performance ends of the markets. This end of the market is driven by technology, performance and design. The home markets of companies are early testing grounds for the products. Second, new technologies like bio-technology, photonics and superconductors generate tomorrow's industries. Early entry in a growth industry reduces market share battles and serves as a future source of earnings. Third, these industries are most likely to be protected at home initially and subsidized by defense spending. Fourth, technology itself restructures industries and provides openings for a newcomer. Open systems architectures are changing the computer industry. Application specific semiconductors are changing the chip business and so on. Thus industries that are restructuring or emerging because of technological change present developmental opportunities to western companies. These companies may or may not have been high technology companies before the new competitive era.

An example of an industry that is restructuring is the food industry. Like financial services, it appears that government is going to play a less protectionist role by the late 1990's. Over time the subsidies are going to be reduced. The technology of farming is favoring the large farmer. The average farm size goes up as professional businesses replace the family farm. The consumer is king in the food business as surpluses abound. The



consumer in the U.S. wants nutrition and health as well as good taste. The new technologies of breeding and bio-technology allow the "design" of new food products by creating animals with low cholesterol, desirable muscle texture, and taste. The companies trying to respond to this new customer driven business are British Petroleum and Volvo among others. Consequently, the food industry strategy and organization are going to be driven by R&D and new product development. Brand recognition and a superior product through bio-technology become the keys to competitive advantage.

In summary, companies are seeking new sources of growth by entering new businesses based on services, software and technology. These services and technologies are usually ones that the organization has mastered in serving its core businesses. Technology businesses in particular lend themselves to new sources of revenue. They are future growth businesses and/or they present opportunities for restructuring existing industries into new sources of revenue. As a result, firms like General Motors, British Petroleum and Procter and Gamble are becoming high technology companies.

Throughout the 1980's and 1990's, companies will follow this strategic sequence. Most companies went into a recovery mode in the early 1980's. They will be pursuing global and development strategies in the 1990's. Aerospace, on the other hand, developed in the 1980's. However, the post-Reagan defense budget will place them in a recovery mode in the late 1980's. For most companies, all of these strategic steps will be in process at any

one time. But for a particular business unit, one of the three, recovery, globalization or development, will take the top priority.

### Organizing for Competitiveness

Implementing these three strategic steps in the new competitive environment is reviving some old organization forms and giving rise to some new ones. The ones that are of particular significance for technology companies are today's Matrix Organization and Network Organizations. Table III portrays the strategic forces that are creating the need for these social forms.

Table III

#### Strategy and Organization

Integrated Responsiveness Consolidation	Matrix Organization
Globalization Organization Fragmentation	Network Organization
Vertical Disintegration Development	

As mentioned above, the strategic forces are causing paradoxes for companies. To be responsive and integrated, companies need small fast acting business units. But to get critical mass in a technology, companies need large functions. The solution for some companies is to use a functional organization with product, project or program overlays.

Previously, these overlays or functions were referred to as matrix-like organization. The forces for the network organization arise from all strategies. Vertical disintegration in recovery and market access in globalization lead to joint ventures and various alliances. Also these same alliances lower barriers to entry for a new business. They permit a new business to get global access and build volume quickly. It is in these new business developments where the network is most likely to arise.

### Today's Matrix

Today's matrix organizations are arising from the conflicting strategic actions described earlier. At the business unit level, pressure for consolidation arises in the recovery of cost competitiveness. As firms seek to reduce duplication, achieve scale in functions with expensive equipment, pool highly specialized talent, reduce the number of people and consolidate purchasing power, they are forming functional organizations. The consolidations are occurring in businesses from General Electric's Major Appliance business to Hewlett-Packard's computer business. At the same time, market pressures are causing firms to respond to the customer faster with more varied offerings. In order to be responsive to customers and deliver new products faster, firms try to create small closely coupled interdisciplinary teams. These are best organized as small autonomous divisions like the old Hewlett-Packard model. But even here conflicts arise. The design and operating functions are best organized on a product basis to deliver products

rapidly. The sales and service functions are best organized on a customer basis to best respond to unique market needs.

The result of conflicting pressures to consolidate and be responsive lead to different organizational bases for different functions. It is not difficult to find businesses where purchasing is centralized and organized around vendor types. The component manufacturing is centralized and organized around manufacturing processes. R&D is centralized and organized by technology. The design, assembly and test operations are decentralized and organized by product line. Sales and service are a single unit organized partly by geography and partly by customer type. These functional alignments are necessary to get superior competitive performance from each unit. However, functional organization creates barriers to integration around a customer or product for fast response.

The answer has been to create processes varying from informal relations to formal product teams to product managers that are overlayed on the functional organization. These overlays or teams are temporary product, market or customer organizations for integration and represent a form of quasi-structure (Schoonhoven and Jelinek, this volume).

A similar situation prevails in the international sector. Conflicting strategic pressures to integrate global businesses across countries and to scatter value added activities and respond to local governments must be dealt with simultaneously. Those organizations that were organized by country, like IBM and DEC, are creating product business unit overlays with world-wide business teams and global product managers. Companies that were

organized by world-wide line of business, like Motorola, are creating country overlays with country teams, country site managers and country managers. Each overlay is to create integration not achieved through the structure. Various forms of matrix organization are occurring because the businesses vary in how global they are and countries vary in how active the host government is. As a result the business managers are strong in some cases and in other instances country managers are the more powerful. For both business unit organization and international organization, the matrix is back. It may be called another name like product management but it is an overlay or matrix-type organization nonetheless.

Today's matrix is different in its successful applications. The companies that are successful manage the matrix shown in Table IV with a planning and budgeting process. Functions could be substituted for countries or regions as columns with no loss of meaning. The Table shows product lines (high end, mid-range, low end, peripheral equipment) in a matrix across countries and regions. The box at the intersection of product and region contains the planned revenues, costs, profits, market shares for that product in that region. The first requirement for a successful matrix is that the company have an information system that reports costs and revenues for all the categories. Second, the company needs a planning process to agree on all the entries. The planning process is a negotiation process between product managers and geographic managers to determine revenue, profit, market share by product by country. The adopted plan then

becomes the target for all managers. Performance becomes a task of meeting all the targets. The reward system is then based on the agreed upon plan.

Table IV  
Planning and Budgeting Matrix

	U.S.	Japan	Europe	Pacific/L.A.
High-End	\$	\$	\$	\$
Med-Range	\$	\$	\$	\$
Low-End	\$	\$	\$	\$
Peripheral	\$	\$	\$	\$

Planning systems are also becoming more event driven and less calendar driven. Rather than an annual exercise, plans are revised when events occur that require revision. These frequent revisions require that the process be computerized.

All of these features are difficult to implement. This difficulty is why most organizations fail at matrix. The problem for managements facing the twin demands of consolidation and responsiveness is to learn to function with the kind of management process described above. In short, matrix and overlays are not a structural problem but one of management process and management selection. The design of information systems, planning process, budgeting processes, performance

measurements, performance assessment processes and reward systems around matrix management issues is key. Selection of managers who can negotiate, influence without authority, become team players and live with ambiguity is a companion design issue. While the strategic steps to restore competitiveness are clear, companies are still grappling with the above issues to learn how to implement those strategies.

### THE NETWORK ORGANIZATION

Ray Miles has labeled a new form of organization emerging today as the Network (Miles and Snow, 1986). Instead of monolithic, vertically integrated hierarchies like IBM or Procter and Gamble of today, companies of tomorrow will be loosely coupled, flexible arrangements between multiple firms. Each firm will perform only what it does best and link with others through sourcing arrangements, long term contracts, alliances, minority investments, and joint ventures. These forms arise as companies vertically disintegrate, expand globally or grow rapidly in new businesses.

The organization design issues for the network organization revolve around the firm which assumes the responsibility for design and maintenance of the network. This firm is called the broker role in the network or the hub firm of the network. The broker role can be played by the corporate headquarters of a company or by the headquarters of a business unit. In this section, the business units are the focus. Business units

face network design issues of two types. One issue is the need to create a presence in all key markets world wide. Key markets are those which give world scale volume, those in which key competitors are present and those in which state-of-the-art technology gets introduced first. In order to get a presence in all key countries, the hub firm must form joint ventures or alliances with local firms. The hub firm must design its international network. A second issue for the hub firm is "What activities in the value added chain for an industry will the firm own and perform?" This second issue is the focus here.

Currently there are predictions that firms are vertically disintegrating (Miles and Snow, 1986) or disaggregating. Indeed firms are buying more services and components rather than performing or making them themselves. However the same pressures for vertical integration still exist. Firms still need guaranteed sources of supply and outlets for their products over the business cycle when supplies are short and channels full. Firms still want to collect profits from the upstream and downstream portions of the industry. The source of profits in an industry will change over the business cycle from upstream to downstream. When chips are in short supply, semiconductor firms make money. When chips are plentiful, systems manufacturers make money and semiconductor firms do not. The result is that companies are transitioning from vertical integration to vertical control. That is, companies are finding ways to achieve the benefits of vertical integration without the costs of ownership. The price however is that management must learn to influence partners that they do not control or own. Like matrix



management, a premium is placed on managing relationships.

The design decisions for the hub firm are:

1. What activities should be owned by the company and which should be acquired through arrangements with other firms?
2. What kind of relationships should be negotiated and managed with these other firms so that adequate control is achieved?

The pattern of response is emerging in recent business start-ups, like Sun Microsystems, Nike, Reebok, Genentech and businesses that are establishing themselves in industries that are restructuring. Established companies in established industries are not vertically disintegrating, although they may sell an activity when it can be easily separated. It is in the new developmental areas that network organization emerges in its extreme form. An example from the food industry will present the issue.

British Petroleum owns breeding and feed subsidiaries. The idea is to create a male/female pair of cattle, hogs, turkeys and so forth. They provide the breeding stock and feed for nutrition to producers (farmers) who raise the stock. They take minority investments in packers and processors to guarantee a market for farmers using their breeding stock. The packer also allows them to control distribution to retailers and other outlets. The control of distribution allows them to use brands for their products like Frank Perdue has done with chickens. Brand recognition and a superior product through bio-technology become

the keys to competitive advantage. The companies like BP that usually vertically integrated the entire product flow, now only perform the product design (breeding animals and seeds) and control the brand and the marketing. That means they own only a breeder and control distribution with a food processor that manages the brand. Castle and Cooke does this with Dole brand pineapples. Currently, it is trying the same approach with other fruits and vegetables. So in consumer businesses, vertical control is exercised through owning technologies to create products, owning the brand, and performing the marketing. All other activities are necessary to deliver product to the customer but are secondary and provide smaller margins. So by performing the dominant functions in the value added chain, a hub firm can exert vertical control without owning all activities along the value added chain.

In commercial businesses like computers and bio-technology, the research function is a key basis of control. Sun Micro Systems attempts to control the value added chain by continuously introducing new technologies that everyone can use. Sun is pursuing open architectures which change the structure of the industry. The results can be seen in personal computers where open architectures and an IBM standard has moved the dominant activity away from the computer manufacturer to the component provider. It is Intel and Microsoft that make money in PC's. Anyone can make the computer but everyone must use Intel's micro-processor and Microsoft's operating system. Hence, Sun created a chip called SPARC and a joint venture with AT&T for a standard

UNIX operating system. It has formed 250 agreements with value added resellers and original equipment manufacturers to distribute its technology. In addition to its own sales force, Sun has 250 other sales forces to sell and distribute its products. It gets critical mass rapidly through networking.

The ability to use technology as a hub from which to control a network depends upon laws which protect intellectual property and pricing schemes which allow inventors to reap downstream profits. For example, Castle and Cooke is fighting to prevent other distributors from using their proprietary seeds. They want only "their" farmers to use the seed and only their branded products to be grown from them. But at the heart of their lawsuit is "What can be patented or copyrighted to protect intellectual property?" Indeed the success of the technology development strategy of western firms depends on the protection of intellectual properties especially in other countries. But even in western countries the limits of protection are being established and challenged. The lawsuit brought by Apple against Hewlett-Packard for allegedly copying the "look and feel" of the Macintosh interface is a good example and a case to follow.

Pricing schemes for securing downstream profits from a technology without vertically integrating downstream are also arising. Cetus Corporation, a research boutique, has invented a bio-technology process with a potential to create some useful pharmaceuticals. They have formed a joint venture with Perkin-Elmer to create a machine which can be purchased by Ciba-Geigy, Upjohn, and others to create these pharmaceuticals. The joint venture has priced the machine low so that lots of laboratories

like university labs can buy it and create drugs. But the joint venture wants a royalty of some 10% from all pharmaceuticals created with their machine. This pricing scheme is one more variation on Gillette's original concept of giving away handles to sell blades. Another pricing concept has been introduced by an architect in Berkeley, California. He charges a usual fee for building designs but also wants 1% of the sale price every time the building is resold. All of these schemes are attempts to brand and profit from one's intellectual and artistic properties. The creator is attempting to profit without creating a vertically integrated organization to make, sell or distribute the final product to the ultimate consumer. The schemes also place power with the creator of the intellectual property so that the company performing creation can act as the broker or hub role in the network organization.

Firms also use other approaches to achieve vertical control. One is simply size. Using purchasing and selling volume, a hub firm deals only with smaller suppliers and customers. Sears has controlled suppliers by buying from small manufacturers and being their dominant or only customer.

A second approach is to use financial services. The big companies entering the food business, which were mentioned earlier, are also using their financial services subsidiaries or joint venturing with other financial services companies to control the value added chain. To farmers who use the company's breeding stock, they will provide loans. For those farmers who use their breeding stock, and also buy their feed and sell to

their packer, they will provide loans with favorable interest rates. In addition, they can reduce the risk to the farmer and packer by guaranteeing price spreads. Through their financial services subsidiary, they use futures markets to hedge their own risk or trade as appropriate. Companies like IBM and AT&T are starting these activities as well. Their customers are buying large systems and networks and much of the profit comes from financing the packages. Through these mechanisms, the large companies achieve the same results as vertical integration would achieve but they have avoided the capital investment of owning all the stages in the industry. Instead of being an owner of the farms and packers, or of subsystem manufacturers and software developers, they are the bankers. Through control of technology, control of the brand and being the banker, the companies achieve vertical control.

The fourth mechanism is information networks. Firms all along the value added chain "plug" into the hub firm's network. All the firms need to adopt compatible systems and standardized accounting and information systems. All the firms in the network benefit by having upstream and downstream visibility. Such visibilities reduce uncertainty, lower inventories and increase responsiveness to end users. On the other hand, it increases the hub firm's control. If you want to do business with General Motors for example you have to adopt MAP, their new computer language and plug into their system.

In summary, network organizations require a hub firm or broker role to create and maintain the network. Firms perform this role and achieve vertical control and avoid the costs of

ownership required by vertical integration. Vertical control is achieved by performing the dominant function in the value added chain, being the biggest firm in the network, being the banker to the network and designing and maintaining the information network for the network organization. A number of issues remain, however. These vertical control relationships are loaded with conflicts of interest and require constant negotiations.

The second design decision for the hub firm is what activities should it own and perform and what activities should it farm out to others in the network? From the discussion above it is evident that hub firms must own and control the dominant functions in the business like product design and marketing the brand. Others like financial services and information systems design are useful but not necessary. An examination of Benetton shows the design logic.

Benetton is not usually thought of as a high technology company. Indeed the fashion industry is probably not high technology. But Benetton performs only the high technology and design intensive activities of the industry. By any criteria it would be a high technology company. It designs the equipment, products, processes, information systems and advertising. Any capital or labor intensive activity is subcontracted. In many traditional industries, high technology firms are restructuring the entire industry as Benetton has done in high fashion. Benetton has chosen to perform only a few of the activities along the value added chain. They perform the marketing function, the product design (fashion clothing for young women) and control the

brand. The manufacturing activities of weaving and sewing are performed by outside contractors. Some manufacturing functions are performed by Benetton. They buy wool and machinery for all members of the network. They design the equipment and the computer aided design processes. They perform the dyeing, an activity in which they have a proprietary process to dye garments after they are made. They perform 1% of the manufacturing so that they get intelligence to negotiate with the rest of the network and get quick turnarounds on new product trials. So Benetton is big when it is advantageous to be big (when buying) and small when it is good to be small (labor intensive sewing). They do the difficult things like manufacturing technology and the proprietary things (dyeing).

All of the sales take place through agents who deal with independent stores in a franchise-like arrangement. Benetton does the distribution and designs the information system for rapid response to fashion trends. General Electric Information Systems runs their network. Their financial services subsidiary provides banking and leasing services to all members of the network. Benetton also has a venture capital subsidiary to finance new high technology, fashion start-ups.

In summary, firms are disaggregating and buying some portion of activities that they used to perform. When vertical disintegration occurs vertical control is still necessary. Control can be obtained through performing the dominant function, being big, being the banker and running the information system. These functions allow a firm to play the broker role and be the hub of the network.

The Network organization is currently in fashion. And it is an appropriate form for many applications. However, vertical integration is not dead. In the oil industry, the producing countries are attempting to re-integrate the industry by arranging for downstream assets. In semiconductors the vertically integrated Japanese firms can cut the price on semiconductors to gain market share vs. U.S. manufacturers. The Japanese vertically integrated producers can profit from low cost semiconductors by selling electronics products more profitably and subsidizing their semiconductor divisions. Their U.S. competitors cannot. Strategic analysis rather than management fashion should determine the design choice.

#### **SUMMARY**

This chapter has described how technology is changing the competitive environment in which business activity is taking place. Organizations are making their core businesses more competitive with emphasis on responsive integration, consolidation and vertical disintegration. They next extend those businesses globally. When cash flow is generated above the core businesses' needs, development becomes the highest priority.

In order to implement these new strategies, firms are adopting matrix-like organizations, network organizations, neo-conglomerates and green field start-ups. In this chapter we described today's matrix organization and emphasized the network as the newest of the organization forms to be used in the 1990's as development becomes the dominant strategy.



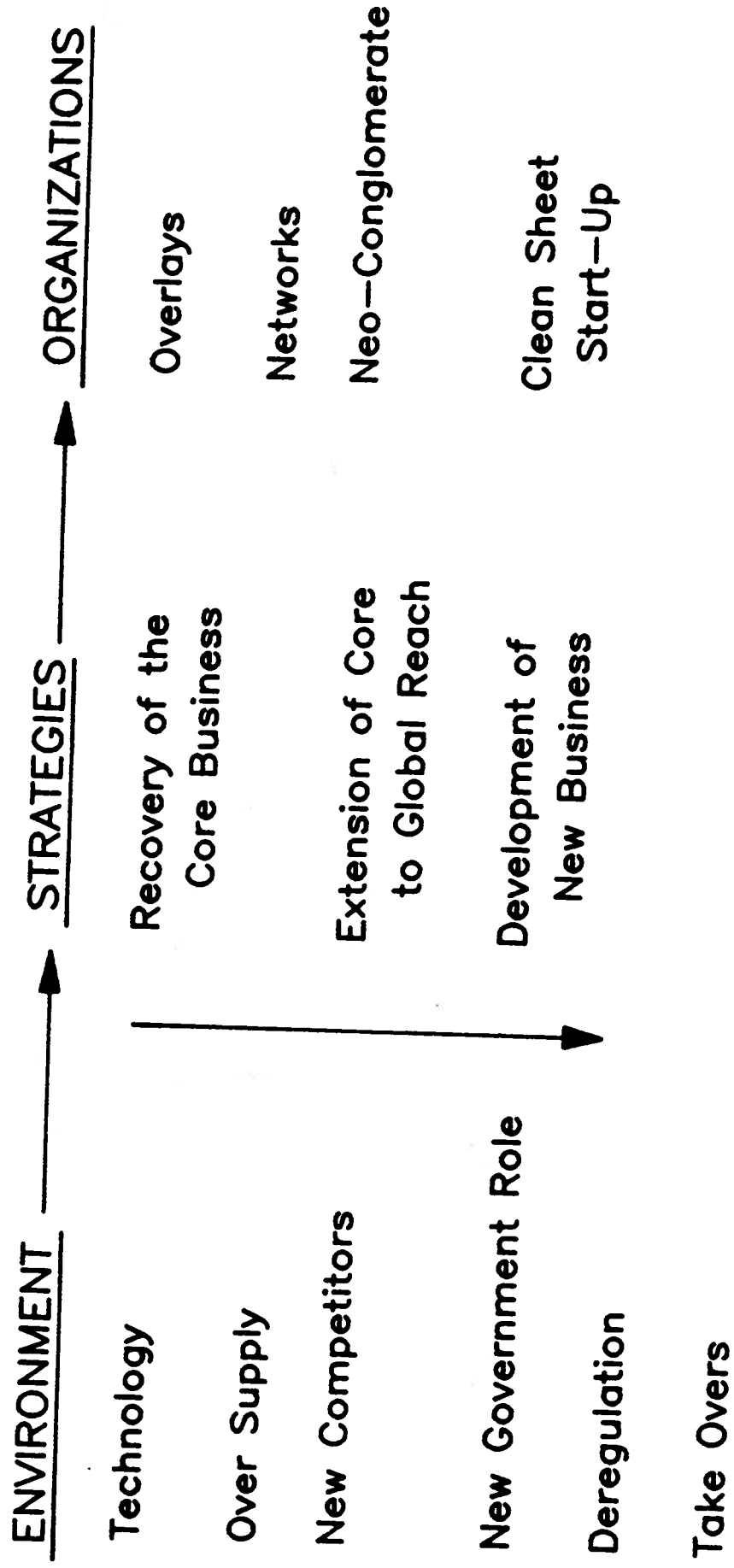
All of these organization forms reduce (but do not eliminate) the importance of formal structures and authority. They increase the need for skills at negotiating and influencing without authority. Those companies that were successful at matrix organization previously have an advantage over others who must learn both matrix and network skills.

The companies that were used as examples in this chapter are often those that are not considered to be high technology. The author wanted to make the point that most manufacturing firms are now becoming high technology firms. General Motors, Procter and Gamble, food companies, paper companies, fashion companies are all being driven by technology. That is, their strategies and organizations are the result of their use of technology to recover and develop in the new global competition. Those companies in the industries mentioned above that do not think of themselves as high technology firms will be at a disadvantage in the new competitive era.

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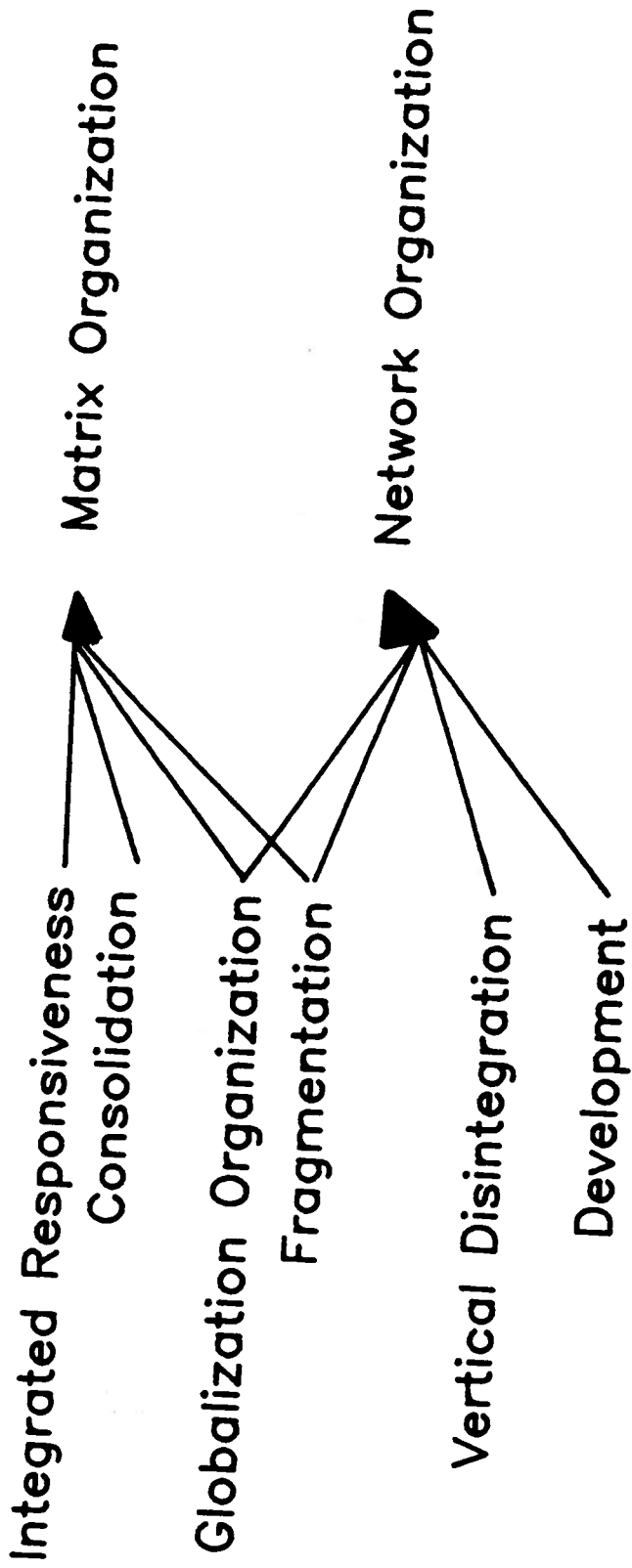
**TABLE I**  
**FRAMEWORK FOR ANALYSIS**



**TABLE II**  
**Recovery Steps**

- Cuts, Quality and Capital
- Responsive Integration
- Consolidation
- Vertical Disintegration
- Employee Involvement

**TABLE III**  
**Strategy and Organization**



**TABLE IV**  
**Planning and Budgeting Matrix**

U.S.      Japan      Europe      Pacific/L.A.

	\$	\$	\$	\$
High-End	\$	\$	\$	\$
Med-Range	\$	\$	\$	\$
Low-End	\$	\$	\$	\$
Peripheral	\$	\$	\$	\$