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THE NEW COMPETITIVE LANDSCAPE

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Technology is rapidly altering the nature of competition and strategy in the late twentieth century, moving us toward a 'new competitive landscape' in the twenty-first century. The new competitive landscape presents new issues, new concepts, new problems and new challenges. This essay examines the broad nature of the technological changes that are occurring and identifies some of the important implications of these changes for strategic management. The purpose of the paper is to stimulate further research into these issues in strategic management and to provide an overall context for the other papers appearing in this special issue.

Technology is rapidly altering the nature of competition in the late twentieth century, causing what some refer to as a 'technological revolution.' As a result, managers and government policy makers face major strategic discontinuities that are changing the nature of competition. Approaches and tools that were effective in the past are found wanting. New tools and approaches are being hurriedly developed. This new competitive landscape is becoming dimly visible. For example, new manufacturing technologies are enabling mass customization in many industries and altering the economics of product variety. The integration of microprocessor and computer technology into many products and services allows differentiation based on software. Software is supplanting hardware in many applications and dramatically altering the pattern of developmental vs. production costs. Telecommunications and computer networks are altering the way managers work and interact, more effectively integrating overseas subsidiaries and alliances with headquarters executives, and permitting technology to be more easily shared throughout the corporation and its associated organizational networks. Furthermore, rapid development of product and process innovations are becoming increasingly important in many global industries to achieve or sustain a competitive advantage. Speed-based organizational processes increase the pace of technological change. In short, technological changes with strategic implications are occurring at a dizzying pace.

Complex technological developments such as these are altering the nature of strategy in many industries. Executives in technology-intensive firms (e.g., electronics, pharmaceuticals, telecommunications, and computers) and in firms that intensively use technology (e.g., airlines, brokerage houses, banks, and electric utilities) must develop a better understanding of the relationship of strategy to technological change and achieve a close integration of the two. Furthermore, the developments in telecommunications and computer technology have far-reaching consequences for the management of all organizations.

The purpose of this essay is to examine important features of the new competitive land-

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scape and their implications for strategic management practice and research. This special issue of the *Strategic Management Journal* brings together a set of research papers dealing with different aspects and implications of the new competition. It is our hope that the special issue stimulates others to proceed with various research investigations, so that firms can better understand, prepare for, and compete on the new competitive landscape. It should be noted that there are broader changes occurring that this essay does not address directly, although in many cases technological change is associated with them in various ways. For example, most significant industries are in the process of globalizing and this is often driven or facilitated by new communications technologies and the new economies in process equipment technology and logistical technology.

The new competitive landscape is currently being shaped. Thus, no definitive view of the landscape is possible. It may be several years or decades before an accurate picture can be developed. This is similar to the Industrial Revolution, which was not well understood until the twentieth century. Others (e.g., Dwyer *et al.*, 1994; Farrell, 1994; Zachary, 1994; Piore and Sabel, 1984; Sproul and Kiesler, 1992) have been chronicling some of these developments, but these discussions have largely occurred in the business press or have been limited to technical discussions of specialized topics. Our examination begins with a discussion of some of the major technological trends and factors driving strategic change, and proceeds to examine the evolving nature of competition and the implications for research in strategic management.

IMPORTANT TECHNOLOGICAL TRENDS AND FACTORS

Herein we identify a number of technological trends and factors that are driving strategic change. Our goal is to examine the most important technological trends and characteristics and organize them into meaningful categories. In particular, we examine: (1) the increasing rate of technological change and diffusion; (2) the information age; (3) increasing knowledge intensity; (4) the emergence of positive feedback industry. These trends and characteristics are often bundled and/or interrelated—one may trigger others. We do not suggest a precise chain of causality, since the causes of such social phenomena are notoriously complex. Rather, we focus on the nature of the overall changes that have occurred.

Increasing rate of technological change and diffusion

Both the rate of technological change and the speed of technological diffusion have increased significantly in recent years. These two changes reinforce each other, and their effects cannot be easily separated. Greater speed of diffusion necessarily implies increased speed of technological change. Increased speed of change necessitates more rapid acquisition of relevant technologies by firms, and hence motivates diffusion-increasing behavior. The drivers of increased technological change and diffusion are numerous, but we focus on a few of the most important.

Since the publication of *Future Shock* by Alvin Toffler in 1971, the increasing pace of change in general and technology in particular has been a recurrent theme in the literature. Tessa Morris-Suzuki (1984) coined the term 'perpetual innovation' to describe the rapid and continuous change that has occurred as information-intensive technologies have replaced older technologies. Recent work on the pace of technological change has generally focused on the shortening of product life cycles (e.g., Rousenau, 1988; Qualls, Olshavsky, and Michaels, 1981; Clark, Freeman, and Hanssens, 1984; Cravens, 1986), and on the resultant need to compete on the basis of time as a critical resource (e.g., Stalk 1988; Bower and Hout, 1988; Quinn and Paquette, 1990). Subsequently, a focus on shrinking product development cycles results in even shorter product life cycles, concluding in a virtuous (vicious) cycle of continuously faster innovation as a basis for competition.

Starting about a decade ago, a growing number of studies (e.g., Ghemawat, 1986; Mansfield, 1985; Levin, *et al.*, 1984; Mansfield, Schwartz, and Wagner, 1981) suggested that the absolute rate of technological diffusion is, indeed, increasing. For example, Mansfield (1985) noted that on, average, it takes only 12–18 months before information on R&D and product decisions become known to competitors. In fact, specific operational information diffuses even faster within the industry, sometimes in less than a year. Mansfield *et al.* (1981) found that 60 percent of patented inventions were imitated successfully in less than 4 years. Badaracco (1991: 37) noted that in the electronics industry it sometimes takes only a few weeks after a new American-made product is introduced in the United States for it to be copied, manufactured and shipped to the United States from an Asian country. According to Rogers and Rogers (1984: 64) some of the electronics firms in Silicon Valley do not apply for patents to prevent competitors from acquiring the technological knowledge contained in the patent application. In fact, it is becoming standard practice in many industries not to patent new product and process developments.

Patents in general are becoming less effective in protecting new technology. Research (Levin *et al.*, 1984; Levin, 1986) has shown that patents are viewed as an effective means of protecting technology only in the chemical and pharmaceutical industries, but are viewed as relatively ineffective in most other industries. Furthermore, in many countries the patent systems are structured quite differently. Spero explains that the Japanese patent system varies from those in North America and Western Europe. The goal in Japan is to spread technology, not to protect it. 'In fact, it serves a larger, national goal: the rapid spread of technological knowledge among competitors in a manner that avoids litigation, encourages broad-scale cooperation, and promotes Japanese industry as a whole' (1990: 58).

In an earlier era there were many physical barriers that protected technology. However these barriers to technology diffusion have become increasingly permeable as industries are now relatively more knowledge-intensive and as firms have diffused their technologies and technology development efforts globally. In gaining access to developing country markets, firms often are required to transfer technology to indigenous organizations. Furthermore, knowledge intensiveness makes protection inherently more difficult. Von Hippel (1988) writes that many high-technology engineers unwittingly leak or trade secrets in nonoffice settings, usually through informal channels. More formally, Von Hippel notes that technical secrets often flow from one U.S. firm to another because of the U.S. tendency toward frequent job changes (high job mobility). For example, in U.S. electronics firms, turnover averaged about 20 percent per year in the 1980s (Ferguson, 1987), Mansfield (1985) notes that the spread of important product development information from one competitor to another also occurs at professional meetings, or through suppliers and customers. As such many firms, according to Mansfield's study of 13 different industries, do not expend much effort to protect a secret that inevitably will spread.

In the past, the value-added component of technological innovation was almost exclusively hardware oriented, but today software has become increasingly important in a broad spectrum of industries. Software is difficult to protect and often readily available for competitors to study. Furthermore, the ease of software additions and/or changes makes possible rapid technological change once a computer or microprocessor has been built into a product or service system.

American colleges and universities have become significant players in creating and diffusing new technologies globally, as well. Many foreign nationals study in prestigious U.S. science and technology centers, and return to their home country with new skills and knowledge (*Fortune*, 1987; *Business Week*, 1989). For example, in 1988 there were about 13,000 Japanese students studying science and technology at U.S. institutions (*The Economist*, 1988). Another important trend is the growing interest by foreign multinationals in setting up partnerships, endowments or other long-term agreements with U.S. universities to gain immediate and direct access to basic and applied science breakthroughs (*Business Week*, 1989).

The Information Age

There have been substantial changes in information technology in recent years. Computers, software, and telecommunications have been evolving in a rapid, complex, and almost chaotic manner. Personal computers, cellular phones, fiber optics, the internet, massive data bases (e.g., Lexis/Nexis), LANs, artificial intelligence, virtual reality, satellite transponders, and teleconferencing represent some of the plethora of developments in this area. The result of these changes is an information-rich, computation-rich, and communications-rich organizational environment, far beyond what was even envisioned only a few years ago. The pace of change in information technology and its diffusion should only continue to increase. For example, it is predicted that the number of personal computers will increase from 150 million today to 278 million in 2010 (almost double in 15 years). Communications satellites are predicted to increase from 1100 to 2260 and wireless communications networks from 34 million to 1.3 billion (*Business Week*, 1994: 194).

It is not only the scope of the changes, but also the decline in the costs and increased accessibility of these resources that are creating a new competitive landscape. Consider, for example, how the global proliferation of relatively inexpensive computing power and the linkages on a global scale of computer networks by telecommunications have increased both the speed of diffusion and change. No longer are sophisticated computer systems and their calculation and design capabilities only available to the large firms in North America, Japan and Western Europe. With relatively inexpensive equipment, sophisticated supercomputers and large data bases can be accessed (even covertly in some cases) on a worldwide basis.

Increasing knowledge intensity

The basis of technology inherently involves knowledge. Mokyr (1990) observes that:

> My basic premise is that technology is epistemological in nature. It is not something that somehow exists outside of people's brains. Like science, culture, and art, technology is something that we know, and technological change should be regarded properly as a set of changes in our knowledge.

Hence, the growing technological orientation of many industries, and the increasing use of computer and telecommunications technology in most organizations, inevitably create greater knowledge intensity. Furthermore, it should be noted that technological knowledge is cumulative and path dependent (e.g., Barney, 1991: Dosi, 1988). It develops over time following specific paths. 'What a firm can hope to do technologically in the future is narrowly constrained by what it has been capable of doing in the past' (Dosi, 1988; 1130). The strong path dependency associated with technological knowledge creation (and knowledge creation in general) means that such current knowledge is a direct function of the firm's formal and informal technological learning in prior time periods (Winter, 1987). This organizational learning is a critical component in gaining and/or maintaining competitive advantage in the new technological landscape (Lei, Hitt, and Bettis, 1995). In fact, many today believe that knowledge is as important as capital and labor to economic success.

The emergence of positive feedback industry

Many of the technologies and industries (e.g., software and biotechnology) that have evolved rapidly in recent years are characterized by positive feedback. Other more traditional industries (e.g., autos and telecommunications) have also become increasingly characterized by positive feedback as they have adopted new technologies. The nature of positive feedback is largely based on increasing knowledge intensity. As such, positive feedback is an important element in the new competitive landscape.

Conventional economic theory stressed self-correcting mechanisms. For example, as a result of the high oil prices in the 1970s, energy conservation (decrease in demand) and oil exploration (increase in supply) increased substantially. Subsequently, the reduced demand and increased supply caused prices to drop significantly in the 1980s. Thus, *negative feedback* dampened the increase in oil prices. Similarly, orthodox economic theory also has assumed that as a firm expands its scale of output, eventually diminishing returns are encountered and costs increase. As such, there is an optimum scale of operations, beyond which profits decline. Negative feedback in terms of diminishing returns prevents a firm from monopolizing a market and helps it settle into its optimum scale of operations. The problem reduces to sizing plants to take advantage of the optimum scale ('minimum efficient scale' is the common economic and engineering terminology). However, this economic dictum is suspect to experienced managers, especially those in high-technology businesses. These suspicions have a solid theoretical basis.

In industries with a high knowledge content, as opposed to natural resource-based industries, it is uncommon for diminishing returns to occur;

instead *positive feedback* is present where returns continue to increase. Typical of such industries are semiconductors, telecommunications equipment, computers, software, automobiles, airframes, factory automation, aircraft engines, biotechnology, and pharmaceuticals. Initial design, development, certification, and tooling can be expensive. Once these are complete, each unit can be produced relatively cheaply. Instead of a dampening effect on capacity expansion, positive feedback results in costs continuing to fall, and as a result increasing returns. The 'optimum scale' may be the entire market and first mover advantages (Lieberman and Montgomery, 1988) or an early lead in market share may be quickly magnified into market dominance.

For example, consider the software industry. The first copy of a new program may cost $50 million to develop, debug, and produce. Each copy thereafter costs less than $0.50 to produce. For each copy produced after the first, total costs per unit continue to fall as the initial $50 million is amortized across more units. There is no optimum scale of production beyond which costs start to rise. Also, once the software program gains sufficient market share, the importance of compatibility may motivate others to adopt it over competing programs that perform the same function(s). Furthermore, subsequent versions of the program are likely to have strong appeal to initial adopters because of switching costs.

As a further example consider the automobile industry, where a totally new model may cost roughly $750 million to $6.0 billion to design, develop, certify to meet government safety and pollution standards, and put into production. Each unit thereafter may cost approximately $1500 to produce. Significant negative feedback is not present. Unit costs continue to fall and returns continue to increase as more units are produced. Additionally, increased production brings other benefits as well. As experience with production accumulates, the firm learns how to produce additional units more cheaply. Furthermore, the knowledge and experience gained in the design, certification, and production of a particular automobile may make it easier to design, certify, and produce other automobiles, vans, or small trucks.

An additional feature often is associated with positive feedback industry (and knowledge intensity). David (1988) and Arthur (1989, 1990) note that a particular technology, as well as technological standards tend to become 'locked in by positive feedback.' Although a technological standard or a technology may not improve with time, widespread adoption creates a situation where new producers or customers find it advantageous to adopt it rather than an alternative. This adoption bias advantage may arise, for example, because new customers need to exchange information, knowledge, or products with those already functioning. Typical examples would include the QWERTY keyboard, the VHS video cassette format, various software programs and languages, or a particular high-definiton television standard. Furthermore, this implies that small historical events (path dependence) that provide one technology with a small lead early in its history can be amplified by positive feedback into lock-in and overwhelming dominance at later stages.

STRATEGIC MANAGEMENT ON A NEW TECHNOLOGICAL BATTLEFIELD

The technological trends discussed above have major implications for competition and strategy. As such, the new competitive landscape requires a significantly different approach to strategy than was common in the past. The discussion of the new competitive landscape is organized into four topics: (1) increasing risk and uncertainty and decreasing forecastability; (2) the ambiguity of industry; (3) the new managerial mindset; and (4) the new organization and disorganization. These discussons frame a concluding section on implications of the new competitive landscape for strategic management practice and research.

Increasing risk and uncertainty and decreasing forecastability

An inevitable consequence of the trends and factors discussed above is the increase in risk and uncertainty. The business world of today is perilous—technological change is fast, pervasive and unpredictable, the required investments are huge; and the penalties for failure are severe. Strategic technology planning has been replaced by technological surprises. Positive feedback and lock-in require firms to make huge investments early in anticipation of market structures that will likely support only a very few profitable firms *if the market does develop*. Furthermore, forecasting technology and industry evolution much beyond a few months is also difficult. Hence, investments must be made before any reasonable market or cost estimates can be made. It is not a question of classic uncertainty modeling where one merely expands the standard distribution around an assumed mean value in order to account for the uncertainty in the estimate. Instead, we are increasingly dealing with unknowability, where the mean and distribution of outcomes cannot be reasonably assumed.

Strategy and investment in this environment cannot be based on forecasting. However, this is not to say that forecasting is useless in a world of rapidly changing technology. Forecasting can be useful, but only in certain ways—not as a driver of strategy. Turbulence does not mean that all variables become equally unforecastable. What it does suggest is that any comprehensive forecast of a technology, an industry, or a market rapidly becomes untenable beyond a short time horizon—a few months or even weeks in certain industries.

For example, the announcement of a new technology, a strategic alliance between two competitors to establish a new standard, or a new innovative product is likely to rapidly alter industry structure. It is important to have a thorough understanding of industry economics and dynamics in order to be able to predict the competitive implications of such moves and quickly develop appropriate responses. In a sense, forecasting becomes even more important. Because of the speed of change it is important quickly to detect changes in the industry and their implications for competition. The time frame of forecasting has shrunk, but it is still important. The structural analysis of industries (Porter, 1980), instead of being a specialized planning tool for forecasting evolution over considerable periods, becomes, instead, useful as a capability to quickly understand the continuously evolving nature of the industry. It is important for firms to identify change at the earliest possible moment, in order to maximize the time they have to react. In fact, given the necessity for quick and appropriate reaction, it can be argued that accurate forecasting has become even more accurate as the forecasting horizon has shrunk from years to weeks.

This leaves unanswered the question of how major capital expenditures are to be evaluated, given the long time frames involved. Such investment as new-technology development projects, new plants, and new businesses usually involve time frames that imply a high degree of unknowability. Discounted cash flow (DCF) applied in such circumstances is little more than a corporate ritual instead of a meaningful analysis and decision technique. The concept of treating such investments as the taking of real (as opposed to financial) options is one conceptual route of attack that has received some initial development (e.g., Bowman and Hurry, 1993; Baldwin and Clark, 1992). However, this research is in its initial development and it is unclear whether or not meaningful quantification can be achieved.

The qualitative nature of uncertainty has changed in one further important manner. Industry dynamics have become increasingly nonlinear as waves of technological change have swept across industries. For example, the basic model for technology diffusion—the logistic curve—is the classic example of a nonlinear relationship that can exhibit chaotic behavior. Furthermore, organizations and technologies have become increasingly complex, and complex systems generally exhibit nonlinear behavior including chaos (Gleick, 1987; Cambel, 1993; Gulick, 1992; Waldrop 1992). Under conditions of nonlinearity, cause and effect are not proportional. A large cause might have a minimal effect, while conversely a small cause can have a huge impact. This is usually referred to as *sensitive dependence on initial conditions*—a condition that all nonlinear systems exhibit. A small perturbation in the system can have a dramatic effect on later results (Loye and Eisler, 1987). For example, a new technology may not represent a massive revision of knowledge, but because of nonlinear relationships may trigger massive changes elsewhere. Nonlinearity obscures relationships, making cause and effect difficult to replicate and/or identify. Even if relationships can be identified, they are difficult to interpret (Lei *et al.*, 1995). Hence effective organizational learning becomes much more difficult.

The ambiguity of industry

Much of the development of industrial organization economics and strategic management has been based on the concept of industry. An industry is usually described as being composed of firms producing products that are close substitutes. Organizations (firms or subunits such as a division) are considered to be *in an industry (or not in an industry)*, and the boundaries of this specific industry do not change over time. Concepts such as industry analysis, competitor analysis, vertical integration, PIMS, strategic groups, market research, and diversification typologies have been based on this approach to defining industry. However, rapid technological change is making the concept of industry elusive—one that often limits rather than facilitates analysis.

Consider, for example, the television industry. At one time the boundaries of the television industry were easily definable. However, they changed with the advent of cable systems. More recently the introduction of telecommunications and interactive computer networks has begun to blur the boundaries of the television industry. In the near future, all forms of communication will likely be carried into a facility (home, business, or other organization) by one cable, which may be owned by the electric utility company, the telephone company, the cable television company, the satellite television company, the facility owner, or some combination. It is also likely that one piece of equipment, albeit complex, at the customer site will be used to receive and transmit signals. This equipment and the connected capabilities may be used for traditional purposes such as watching movies, and nontraditional uses such as banking. The result is a jumbling of the communications, computer, software, television, and other industries. In anticipation of this eventual environment, there have been a large number of mergers and strategic alliances between communications, computer, cable, and movie firms in recent years. In future years, the competitors of CBS may include not only firms like NBC, ABC, HBO, and CNN; but also AT&T, the baby bells, Microsoft, Apple, and Sony.

Essentially, the boundaries of industry begin to blur as substitute products are developed in other industries, and as technologies fuse together to form new products and product categories. Advancing technology and technology fusion have produced increasing numbers of products that have multiple and sometimes new functions, frequently providing substitutes for existing products and industries. Industry boundaries may also be more ambiguous as firms move into global markets. Certainly, it becomes more difficult to identify the competitors precisely, along with their resources, strategies, and future strategic actions. Such identification is made more complex by huge *Kerietsus* (Japan), and *Chaebols* (Korea) that operate as complex networks of firms.

Finally, the increasing number of strategic alliances has changed the dynamics within and across industries. For example, alliances formed to develop new technology, such as research consortia (often a consortium of domestic competitors), change the incentives and dynamics within an industry, whereas stakeholder alliances (e.g., alliance of a firm with its suppliers or customers using electronic data interchange) can change the dynamics across industries. Some stakeholder alliances increasingly represent a hybrid between vertical integration and independent contracting.

Traditional competitor analyses were similar to taking a photograph of a moving target. However, in the new competitive landscape such analyses are similar to trying to photograph a constellation of comets. The blurring of industries makes it more difficult to decide what to photograph and to capture its projection when identified.

The new managerial mindset

In past years managers developed and operated according to managerial mindsets formed through years of experience (Prahalad and Bettis, 1986; Bettis and Prahalad, 1995). Managers' experiences were often in traditional organizations employing formal strategic planning. However, the traditional managerial mindset can no longer produce effective strategies and strategic processes in the new competitive landscape.

The watchword in the new competitive landscape is flexibility in strategy and organization. Because of the rapid changes in technology and speed with which new products are introduced to the market, firms must remain flexible in the strategies they employ to respond to competitors' strategic actions. To have strategic flexibility, firms must use a flexible process of strategic decision making to maintain flexibility in the deployment of critical resources (Sanchez, 1995).

Managers must also develop a mindset that allows cooperation with competitors as well as traditional economic competition. Because of the need to pool resources to develop more and better new technology in order to remain competitive, firms have been forced in numerous cases to form competitive alliances with current and potential competitors. Strategic alliances are particularly prominent between domestic and foreign competitors, but are also numerous between domestic competitors to help fight off foreign competition or achieve, at least, competitive parity in global markets (e.g., research consortia).

Because of the dynamism of the new competitive landscape, firms cannot remain static even if they operate in mature industries. Incremental (and perhaps even radical) innovation may lengthen the product life cycle (Banbury and Mitchell, 1995) and change the competitive dynamics within the market. Thus, firms in the new competitive landscape must achieve dynamic efficiency (Ghemawat and Ricart i Costa, 1993) often regardless of their industry's life cycle. As such, managers must have an entrepreneurial mindset, emphasizing innovation in most industry settings.

The significant dynamism in the new competitive landscape requires that firms concurrently unlearn (Bettis and Prahalad, 1995; McGill and Slocum, 1994) and learn. Managers must have a mindset that allows them to unlearn traditional practices, processes, and strategies and to be receptive to new ones. In fact, they must have a learning-oriented mindset; the ability to learn and unlearn is important. Levinthal and March (1993) argue that learning can improve organizational performance, but also limit future improvements. They suggest that learning creates a simplified world to which the organization becomes specialized. The self-reinforcing nature of learning helps sustain a current focus (e.g., core competence). Because of the simplified world and the reinforcing nature of success from learned behavior, firms become vulnerable to environmental change. Therefore, the managerial mindset in the new competitive landscape must entail continuous and simultaneous unlearning and learning.

Finally, the managerial mindset must change from a focus on a vertical to a horizontal organizational structure. In fact, Mitroff, Mason, and Pearson (1994) argue that a radical reconception of organization structure is required. They refer to this change in the managerial mindset as a framebreak. The traditional hierarchical structures slow decision making and implementation processes (Halal, 1994). Horizontal structures with decision making decentralized to cross-functional teams unleash creative forces in the organization. These forces are necessary for a firm to respond and operate in the new competitive landscape.

In summary, the new managerial mindset emphasizes strategic flexibility and cooperation simultaneously with competition. It emphasizes dynamic efficiency (innovation and entrepreneurial behavior) and concurrent unlearning and learning. Finally, the new managerial mindset is refocused from a vertical, hierarchical structure to a horizontal decentralized one with cross-functional teams (as opposed to specialized functional structure). Thus, the new competitive landscape likely requires significant changes in the traditional managerial mindset.

The new organization and disorganization

The new competitive landscape dramatically changes the imperatives to which effective organizations must respond. Three new imperatives will increasingly drive the direction of organizational design: (1) decreased transaction costs; (2) increased penalties for mistakes and hesitancy; and (3) competition based on knowledge accumulation and deployment. These three follow directly from the technological trends and factors discusssed above. Improvements in information technology are decreasing transaction costs, especially in transactions with suppliers and customers. The rapidity of technological change and diffusion, and the emergence of positive feedback industry (and the associated lock-in phenomena), are increasing the economic penalties for hesitancy and mistakes. Increasing knowledge intensity and the information revolution are shifting the basis of competition to knowledge and learning. The impact of these three new imperatives on organizations is far reaching. Specifically, these imperatives imply: (1) a redefinition of organizations and the competitive entity; (2) an incease in the explicit importance of organizations as learning systems; and (3) a new generalized organizational strategic response capability.

Redefinition of organization

In the past organizations were thought of as being distinct from markets and vice versa. In fact, scholars of management and economics were typically housed in two separate schools in the university and seldom interacted. Today, the distinctions between the markets and organizations are becoming blurred, as are the academic disciplines of management and economics.

The information revolution has reduced the magnitude of monitoring, control and coordination transaction costs. Hence, the calculus of organization as a way of economizing on transaction cost (Williamson, 1985) has changed in many cases to favor externalizing many transactions. For example, electronic data interchange (EDI), teleconferencing, and computer networks, make it possible to coordinate and control complex production processes and R&D projects across organizations as opposed to internalizing them in one organization. This, in turn, facilitates greater specialization in organizations and, hence, reduced size. (See Reich, 1991, for an extensive discussion of some implications of specialization and reduced size.) These changes represent a movement toward disaggregation or 'disorganization' where large multipurpose organizations are replaced by networks of specialized organizations (Halal, 1994). This disorganization process also suggests that competition increasingly takes place among networks and not atomistic firms. For example, in personal computers the Intel/Microsoft-based network currently competes with the Apple/IBM/Motorola-based network. Much of the current strategic management literature is directed at atomistic organizations instead of networks.

Increased learning emphasis

Increased emphasis in academic studies (e.g., Levinthal and March, 1993) and in the managerial literature (e.g., Senge, 1990) clearly show the relevance of organizational learning. Rapid technological change and the information revolution have flooded the firm with raw information. This flood of information has not been matched by a proportionate increase in the ability of firms to interpret this information or to learn from it. As noted earlier, firms find it difficult to unlearn past practices, partly because of the self-reinforcing nature of learning.

While it is extremely difficult in the new competitive landscape, firms must develop and exercise the capacity to learn (Slocum, McGill, and Lei, 1994). All firms experience change, but not all learn from it (Hitt *et al.*, 1994). To achieve a state of equilibrium in a chaotic environment requires that firms develop the capacity for meta-learning or self-sustaining learning (Hamel, 1991; Prahalad and Bettis, 1986; Lei *et al.*, 1995).

Environmental turbulence can trigger firm knowledge creation, but such chaos only serves as a catalyst for creative forces in firms with the capacity for meta-learning (Nonaka, 1994). Without such capacity, environmental changes (e.g., the introduction of a new technology may trigger destructive forces within the firm. Concepts such as absorptive capacity (Cohen and Levinthal, 1990) which focus on technological learning from the environment offer much promise.

Strategic response capability

In an era of rapid technological change and resultant unforecastability, sustainable advantages are far more likely to come from organizational resources, capabilities, or competencies (e.g., Barney, 1991; Lei *et al.*, 1995) than from formal long-range strategic planning. Concepts such as core competency and resouce-based theories of competitive advantage provide important tools for thinking about strategy and the direction of investment in such environments. They provide useful guidelines for answering the question: 'How and where to focus investment when the future cannot be forecast?' However, another important characteristic in the new competitive landscape is the generalized ability to respond fast when change or surprise occurs. We refer to this as strategic response capability. If firms cannot forecast then they must have the capability to respond quickly. Strategic response capability is built on specific skills and resources.

It can be compared to the stimulus–response paradigm of biology where the capability of an organism to respond to stimuli in the environment is a key determinant of its fitness for survival.

Figure 1 summarizes the nature of this generalized capability. It can be thought of as a conceptual objective function to be addressed by the design of the organization. In this figure the likelihood of a satisfactory response is plotted against the response time for a hypothetical firm to yield a strategic response curve. An event or condition that may require a response, such as the introduction of a new technology, occurs at time zero. The positive *y*-intercept of the graph reflects the fact that no response may be necessary. As shown in the figure, we define this intercept as the robustness of the initial position. By robustness, we mean the potential for success under varying future circumstances or scenarios. Hence, the higher the *y*-intercept the more robust the resource deployment and the less likely that any response will be necessary. Robustness is, thus, important in evaluating strategies and resource deployments. Scenarios may be used in the strategy development process to test for robustness. The initial portion of the graph with a positive slope suggests that analysis of this event and redeployment of resources will improve the likelihood of a satisfactory response beyond the *y*-intercept. However, at some point the delay becomes damaging and the slope rapidly becomes negative, suggesting the response is too slow. As change accelerates this point of deterioration for firms is moving backward toward the origin.

Two key points are readily apparent from this graph. First, increasing robustness improves the likelihood of a satisfactory response as noted above. Second, increasing the slope of the portion of the curve with a positive slope suggests an improved strategic response capability. Figure 2 illustrates this point for two competitors with the same robustness. As shown the competitor with a higher slope will be more likely to respond appropriately at any particular response time. Alternatively, the firms with the higher response curve will have a quicker response at any particular likelihood of success. Hence, a clear objective for firms operating in the new competitive landscape should be to shift their strategic response curve upward, or equivalently, improve their strategic response capability. Several current managerial techniques such as shrinking product development cycle times can obviously be beneficial. At the conceptual level strategic response capability must incorporate the abilities to rapidly: (1) sense change in the environment; (2) conceptualize a response to that change; and (3) reconfigure resources to execute the response. For example, a flatter hierarchy reduces both transmission time and the distortion as information moves up and down the hierarchy, and, thus, improves performance in all three categories. Further work is needed to develop an overall package of specific mechanisms for shifting the strategic response curve upward.

CONCLUSION

Our description of the new competitive landscape suggests that firms exist in highly turbulent and often chaotic environments that produce disorder, disequilibrium, and significant uncertainty (Prigogine and Stengers, 1984). For example, the introduction of a new technology can create

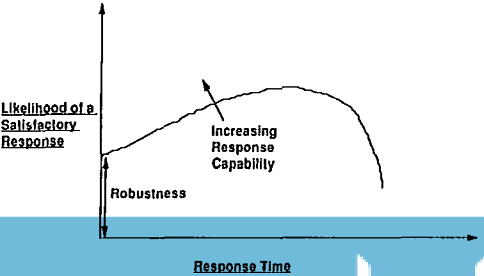

Figure 1. Strategic response capability

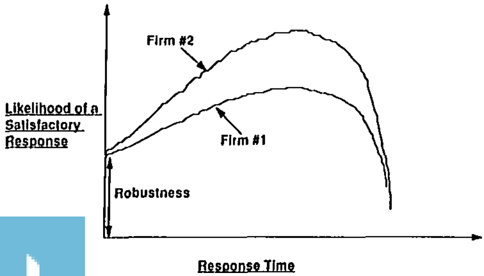

Figure 2. Strategic response capability

'gusts of creative destruction' (Pisano, 1990; Schumpeter, 1975) and, thus, discontinous change (Tushman and Anderson, 1986). In such an environment, managers must develop new tools, new concepts, new organizations, and new mindsets.

One thing is clear: much more research is required to understand the new competitive landscape, and how firms can successfully navigate within it. This special issue represents the beginning of an explicit journey to understand the new competitive landscape. In particular, the papers that follow discuss mass customization (Kotha, 1995), technological collaboration (Tyler and Steensman, 1995), national technological policy and 'excessive' competition (Brahm, 1995), modularity and technological substitution in networks (Garud and Kumaraswamy, 1995), technological bandwagons (Wade, 1995), strategic flexibility (Sanchez, 1995), incremental innovations (Banbury and Mitchell, 1995), and environmental technologies and strategy (Shrivastava, 1995). Not appearing explicitly in the issue, but with pervasive influence, were three special referees: Rebecca Henderson, Deborah Dougherty, and Warren Boeker. They attended the conference that preceded this issue and provided substantial and real-time feedback to the authors that substantially improved the quality of the final papers. Their contribution is greatly appreciated. Mary Lou Schendel, the Executive Editor, made the whole undertaking as easy and logical as any editorial job can be. While this journey has only begun, we hope that the ideas presented in the special issue serve as a catalyst for more research. As we move toward the twenty-first centruy, substantial innovation in strategic management will be necessary for competitive success. We look forward to reading about it in the upcoming years in the *Strategic Management Journal*.

REFERENCES

Arthur, W. B. (March 1989). 'Competing technologies, increasing returns, and lock-in by historical small events', *Economic Journal*, pp. 116–131.

Arthur, W. B. (February 1990). 'Positive feedbacks in the economy', *Scientific American*, pp. 93–99.

Badaracco, J. L., Jr. (1991). *The Knowledge Link: How Firms Compete through Strategic Alliances*. Harvard Business School Press, Boston, MA.

Baldwin, C. and K. Clark (Summer 1992). 'Capabilities and capital investment: New perspectives on capital budgeting', *Journal of Applied Corporate Finance*, pp. 67–87.

Banbury, C. M. and W. Mitchell (1995). 'The effect of introducing important incremental innovations on market share and business survival', *Strategic Management Journal*, Summer Special Issue, **16**, pp. 161–182.

Barney, J. B. (1991). 'Firm resources and sustained competitive advantage', *Journal of Management*, **17**(1), pp. 99–120.

Bettis, R. A. and C. K. Prahalad (1995). 'The dominant logic: Restrospective and extension', *Strategic Management Journal*, **16**(1), pp. 5–14.

Bower, J. L. and T. M. Hout (November–December 1988). 'Fast-cycle capability for competitive power', *Harvard Business Review*, pp. 110–118.

Bowman, E. H. and D. Hurry (1993) 'Strategy through the options lens: An integrated view of resource investments and the incremental choice decision', *Academy of Management Review*, **18**(4), pp. 760–782.

Brahm, R. (1995). 'National targeting policies high-technology industries, and excessive competition', *Strategic Management Journal*, Summer Special Issue, **16**, pp. 71–91.

Business Week (7 August 1989). 'Advanced bio class? That's over at Hitachi Hall', pp. 84 and 85.

Business Week (June 1994). 'Snapshots of the next century', Special Issue on 21st Century Capitalism, p. 194.

Cambel, A. B. (1993). *Applied Chaos Theory: A Paradigm for Complexity*. Academic Press, Boston, MA.

Clark, W. H., H. Freeman and D. Hanssens (1984). 'Opportuities for revitalizing stagnant markets: An analysis of household applicances', *Journal of Product Innovation Management*, **1**(4), pp. 242–254.

Cohen, W. and D. A. Levinthal (1990). 'Absorptive capacity: A new perspective on learning and innovation', *Administrative Science Quarterly*, **35**, pp. 128–152.

Cravens, D. W. (September–October 1986). 'Strategic forces affecting marketing strategy', *Business Horizons*, pp. 77–88.

David, P. (1988). 'Path dependence: Putting the past into the future of economics', IMSSS Tech. Report No. 533, Stanford University.

Dosi, G. (1988). 'Sources, procedures and microeconomic effects of innovation', *Journal of Economic Literature*, **26**, pp. 1120–1170.

Dwyer, P., P. Engardio, Z. Schaler and S. Reed (June 1994). 'Tearing up today's organization chart', *Business Week*, Special Issue on 21st Century Capitalism, pp. 80–90.

Farrell, C. (June 1994). 'The triple revolution', *Business Week*, Special Issue on 21st Century Capitalism, pp. 16–25.

Ferguson, C. H. (1987). 'Sources and implications of strategic decline: The case of Japanese-American competition in microelectronics', working paper,

Massachusetts Institute of Technology.
Fortune (21 December 1987). 'How Japan picks America's brains', pp. 65–72.
Garud, R. and A. Kumaraswamy (1995). 'Technological and organizational designs for realizing economies of substitution', *Strategic Management Journal*, Summer Special Issue, **16**, pp. 93–109.
Ghemawat, P. (1986). 'Sustainable advantage', *Harvard Business Review*, **64**, pp. 53–58.
Ghemawat, P. and J. Ricart i Costa (1993). 'The organizational tension between static and dynamic efficiency', *Strategic Management Journal*, Winter Special Issue, **14**, pp. 59–73.
Gleick, J. (1987). *Chaos*, Viking Press, New York.
Gulick D. (1992). *Encounters with Chaos*. McGraw-Hill, New York.
Halal, W. E. (1994). 'From hierarchy to enterprise: Internal markets are the new foundation of management', *Academy of Management Executive*, **8**(4), pp. 69–83.
Hamel, G. (1991). 'Competition for competence and inter-partner learning within international strategic alliances', *Strategic Management Journal*, Winter Special Issue, **12**, pp. 83–104.
Hitt, M. A., J. S. Harrison, R. D. Ireland and A. Best (1994). 'Lifting the veil on acquisition success and failure', Working paper, Texas A&M University.
Kotha, S. (1995). 'Mass customization: Implementing the emerging paradigm for competitive advantage', *Strategic Management Journal*, Summer Special Issue, **16**, pp. 21–42.
Lei, D., M. A. Hitt and R. A. Bettis (1995). 'Dynamic core competences through meta-learning and strategic context', *Journal of Management*, in press.
Levin, R. C. (1986). 'A new look at the patent system'. *American Economic Review*, **76**(2), pp. 199–202.
Levin, R. C., A. K. Klevorick, R. R. Nelson and S. G. Winter (1984). *Survey Research on R&D Appropriability and Technological Opportunity*. Yale University Press, New Haven, CT.
Levinthal, D. A. and J. G. March (1993). 'The myopia of learning', *Strategic Management Journal*, Winter Special Issue, **14**, pp. 94–112.
Lieberman, M. and D. Montgomery (1988). 'First mover advantages', *Strategic Management Journal*, Summer Special Issue, **9**, pp. 41–58.
Loye, D. and R. Eisler (1987). 'Chaos and transformation: Implications of nonequilibrium theory for social science and society', *Behavioral Science*, **32**, pp. 53–65.
McGill, M. and J. Slocum (1994). *The Smarter Organization: How to Build a Company that Learns, Unlearns and Adapts to Capitalize on Marketplace Needs*. Wiley, New York.
Mansfield, E. (December 1985). 'How rapidly does new technology leak out', *Journal of Industrial Economics*, pp. 217–223.
Mansfield, E., Schwartz and S. Wagner. (December 1981). 'Imitation costs and patents: An empirical study', *Economic Journal*, pp. 907–918.
Mitroff, I. I., R. O. Mason and C. M. Pearson (1994). *Framebreak: The Radical Redesign of American Business*. Jossey-Bass, San Francisco, CA.
Mokyr, J. (1990). *The Lever of Riches: Technological Creativity and Technological Progress*. Oxford University Press, New York.
Morris-Suzuki, T. (1984). 'Robots and capitalism', *New Left Review*, **47**, pp. 109–121.
Nonaka, I. (1994). 'A dynamic theory of organizational knowledge creation', *Organization Science*, **5**, pp. 14–37.
Piore, M. J. and C. F. Sabel (1984). *The Second Industrial Divide: Possibilities for Prosperity*. Basic Books, New York.
Pisano, G. P. (1990). 'The R&D boundaries of the firm: An empirical analysis', *Administrative Science Quarterly*, **35**, pp. 153–176.
Porter, M. E. (1980). *Competitive Strategy*. Free Press, New York.
Prahalad, C. K. and R. A. Bettis (1986). 'The dominant logic: A new linkage between diversity and performance', *Strategic Management Journal*, **7**(6), pp. 485–501.
Prigogine, I. and I. Stengers (1984). *Order out of Chaos*. Bantam Books, Toronto.
Qualls, W., R. Olshavsky and R. Michaels (1981). 'Shortening of the PLC: An empirical test', *Journal of Marketing*, **45**, pp. 76–80.
Quinn, J. B. and P. Paquette (1990). 'Technology in services: Creating organizational revolutions', *Sloan Management Review*, **32**(2), pp. 67–82.
Reich, R. B. (1991). *The Work of Nations*. Alfred K. Knopf, New York.
Rogers, E. M. and J. K. Rogers (1984). *Silicon Valley Fever*. Basic Books, New York.
Rousenau, M. D. (1988) 'Speeding your new product to market', *Journal of Consumer Marketing*, **5**(2), pp. 27–40.
Sanchez, R. (1995). 'Strategic flexibility in product competition', *Strategic Management Journal*, Summer Special Issue, **16**, pp. 135–159.
Schumpeter, J. (1975). *Capitalism, Socialism, and Democracy*. Harper & Row, New York.
Senge, P. M. (1990). *The Fifth Discipline*. Doubleday/Currency, New York.
Shrivastava, P. (1995). 'Environmental technologies and competitive advantage', *Strategic Management Journal*, Summer Special Issue, **16**, pp. 183–200.
Slocum, J. M., M. McGill and D. Lei (Autumn 1994). 'The new learning strategy: Anytime, anything, anywhere', *Organizational Dynamics*, pp. 33–47.
Spender, J.-C. (1993). 'Competitive advantage from tacit knowledge? Unpacking the concept and its strategic implications', *Academy of Management Best Papers Proceedings*, pp. 37–41.
Spero, D. M. (1990). 'Patent protection or piracy: A CEO views Japan', *Harvard Business Review*, **68**(5), pp. 58–67.
Sproul S. and L. Kiesler (1992). *Connections: New Ways of Working in the Networked Organization*. MIT Press, Cambridge, MA.
Stalk, G. (July–August 1988). 'Time: the next source of

competitive advantage', *Harvard Business Review*, pp. 41–51.
The Economist (30 January 1988). 'Into the mind field', p. 68.
Toffler, a. (1971). *Future Shock*. Bantam Books, New York.
Tushman, M. and P. Anderson (1986). 'Technological discontinuities and organizational environments', *Administrative Science Quarterly*, **31**, pp. 439–465.
Tyler, B. B. and H. K. Steensma (1995). 'Evaluating technological collaborative opportunities: A cognitive modeling perspective', *Strategic Management Journal*, Summer Special Issue, **16**, pp. 43–70.
Von Hippel, E. (June 1988). 'Trading secrets over beers', *Across the Board*, pp. 52–56.
Wade, J. (1995). 'Dynamics of organizational communities and technological bandwagons: An empirical investigation of community evolution in the microprocessor market', *Strategic Management Journal*, Summer Special Issue, **16**, pp. 111–133.
Waldrop, M. M. (1992). *Complexity: The Emerging Science at the Edge of Order and Chaos*. Simon & Schuster, New York.
Williamson, O. E. (1985). *The Economic Institutions of Capitalism*. Free Press, New York.
Winter, S. G. (1987). 'Knowledge and competence as strategic assets'. In D.J. Teece (ed.), *The Competitive Challenge*. Ballinger, Cambridge, MA.
Zachary, G. P. (27 June 1994). 'The cry of the luddite', *Wall Street Journal*, p. R28.