

# New Economy Requires New Management

BY NITTA ACHARYA\*



Today's global business needs more trade routes and telecommunications channels, rather than the historical transportation paths.

**L**et me begin with a short story. A California company, Hewlett-Packard, had a strong market position in computers and life in computer peripherals. HP recognized there would be a very large market for personal computer printers and analyzed its technology capabilities.

Meanwhile, in Japan, Canon, well known in the camera field, had developed an outstanding printer engine technology, but had neither a position in computers nor computer peripherals, thereby no market access. Uncertain how to market its technology, Canon obtained a license at a computer conference to present its technology. An HP engineer spontaneously visited the Canon booth. This initial contact subsequently led to an alliance whereby the Hewlett-Packard printer, with the Canon printer engine, has dominated the laser printer market.

HP has continued its research in printer engines. It has developed a printer engine based on an alternative technology to Canon, and it will employ that in its latest printer products.

What does this story illustrate? One company was missing a critical technology and another did not have market access. Let us also note that their joining together was primarily opportunistic and not the result of a planned analysis of technology assets by Hewlett-Packard nor the analysis by Canon of which company might have the market access lead.

Analysts point to observe is that the alliance did not remain static. A technology awareness is critical for

technology-based companies in today's world of instant global communication. This leads to intense global competition. Companies that survive will be those companies that are best able to manage their technology and drive upon strategic patterns worldwide.

This paper will emphasize both that management of technology and strategic linkages between organizations worldwide are critical for survival in today's information-based economy.

First will be discussed today's economic environment, the "New Economy." It is the knowledge-based economy that is the reality in which technology-based companies must do business today. Then we will cover the challenge to commercializing technology in the New Economy. And finally, we will propose techniques for companies to manage their technology through a process known as technology mapping.

## THE NEW ECONOMY

Never before in history have economic opportunities been so plentiful and the challenges so great. In today's challenging and, perhaps, frenzied world of rapid change and diversity, there are extraordinary opportunities in the New Economy.

The New Economy is born from the explosion in information. The fundamental cause of the restructuring of the world's economy is not anything today refers to the exponential increase in information processing capabilities and resulting social changes. Middle management is disappearing, IBM is disassembling, the Soviet empire disintegrating, and Microsoft, valued at 81 point six has a market cap greater than that of General Motors. These can all be linked to the microprocessor.

One popular illustration of the

drive of the information explosion is the linear increase since 1990 of the capacity of the microprocessor, which had led to spending, usage of personal computers worldwide, particularly in Western Europe and in North America.

By 1990, the usage of personal computers in North America and Western Europe exceeded 100 million units. At the same time, in the former Soviet Union, the number of such computers was estimated in the thousands, certainly well below one million. This was recognized by Gorbachev and advisors as being a critical and central factor in the decisions that have led to the disassembling of the Soviet empire. Likewise, they would be talking quiet and quiet behind the Iron Curtain. Essentially, it stems of the well being of their citizens, they already had.

Because that information processing capability has differed into the hands of so many, it has increased the rates and accelerated the speed of innovation in all knowledge industries. And, as a result, it has enabled global communication to flourish, thereby competition is increasingly global. Now key companies are as likely to be across the Atlantic or Pacific as across the desert border and it is not limited to the information technology industry.

There is a rapid form of co-evolution in technology occurring because of the rapid dissemination of information. A breakthrough in one field will pull other breakthroughs in disparate fields. For example, computer power has enabled the sequencing of genes, and from that has come new capabilities to develop

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### therapeutics and diagnostics.

A new computer will enable a jet engine improvement, which in turn will drive aircraft improvement.

The growth of information processing capability is the driver of changes in the economy and the way firms organize. These changes can be characterized by those of us who deal in technology development by the relationship between technology supply and technology demand. That relationship is changing in all industries where knowledge is a key asset.

### TECHNOLOGY SUPPLY

With computers at everyone's fingertips, the large companies that controlled technology no longer can. The large companies are decentralizing and disseminating in order to compete. The market place has seen many new products, more diversity in those products, and shorter product life cycles. The rate of diffusion of technologies is determined by the market rather than directed by the large companies.

In my experience, in the last 10 years there has been an explosion in technology transactions with the rate continuing to increase. John Young, former president at Hewlett-Packard, notes, "It's a race to see who can get there first." Kevin McKenna, a Silicon Valley guru, observes, "Everything is real time."

Technology is permitting a shift from the mass-production model to flexible specialization. For further reading on this topic, I refer you to the second edition of *Design by Flow and Fold*. This structure was articulated by Steve Heller in *Future Shock* when he observed, "We will soon see the day when diversity costs no more than uniformity."

### Technology Demand

On the technology-demand side, there is more demand for customization and more is occurring. There is more fragmentation and specialization. For example, whereas there were relatively few software products to be installed for mainframes, software markets are now increasingly fragmented. Software is tailored to individual preferences. The windows of opportunity are also

shorter, and narrower.

### THE COMPETITIVE CHALLENGE

So, what are these factors of technology supply and technology demand doing to us? The competitive challenge is that there is a flood of technologies being entry into fragmented and customized markets. Knowing markets and applications, and adapting to matching technologies to markets quickly, is critical.

As Robert Reich observed in *The Work of Nations*, "In the high-value enterprise, profit is derived not from scale and volume, but from continuous discovery of new linkages between solutions and needs." Thus, the new world economy has certainly been recognized by the new United States Secretary of Labor.

There has been a plethora of articles in business periodicals relative aspects of the New Economy are being recognized. The ultimate characterization of the New Economy of the business organism that will succeed, is the "Virtual Corporation," where the right mix of resources is rapidly assembled to exploit a specific market and technological opportunity and then dismantled.

Note I said organism and the parallel with a biological organism should not be overlooked. The economic model of the industrial economy was mechanical — in the new, information-based economy the biological model is more appropriate because information processing is the fundamental function of biological organisms.

In an article on the Virtual Corporation in a U.S. business periodical, *Business First*, in February 1993, it was observed, "In today's world of increasing global markets and fierce competition, the windows of opportunity are frustratingly brief." The article also noted, "Few companies boast in-house expertise to quickly launch diverse and complex products in different markets."

### CHARACTERISTICS FOR SUCCESS

To be successful in the New Econ-

omy, organizations must have three basic characteristics:

1. Be agile.
2. Be interdependent.
3. Be international.

An agile company will be prepared to make the decisions to put technology into such stability in, to diverse and rapidly evolving markets in a situation where diversity market is absolutely critical.

For an example of interdependence, let us look at the paradigm for the future of today's biotech company start-up. Such a company will leverage its research through a research agreement with a university. It will enter into an agreement with an established pharmaceutical company for co-promotion. It will enter into an agreement with another company for a portfolio on all of its regulatory testing requirements. It also will enter into an alliance for manufacturing of the product. We can say that alliances (interdependence) can come in many forms.

Lastly, to be successful in the New Economy, organizations must be international. If the innovating company does not cover all markets quickly, its competitors will enter those it neglects, learning from the innovator's experience, improving, and so strengthening, enter the innovator's home market. The days when a company could develop and introduce a product in its home territory, accumulate capital, and then go overseas are gone forever. The linear model is dead. Competition is increasingly global.

### COMPETITIVE SKILLS

Beyond the requirement for an organization to be agile, interdependent, and international, what fundamental people skills must it possess? First, it must have the problem-solving technical skills to deal with emerging technologies and needs. There are the skills possessed by engineers, scientists and technicians.

Next are the marketing skills to help customers understand their needs and conceive and present the customized product. As Robert Reich points, "The art of persuasion is replaced by identification of ap-

particulars."

Lastly, a company must have the organization of skills and capabilities to rapidly assemble the right talents — technical and marketing — and manage the process efficiently. In Robert Reich's terminology, this is called the role of the "strategic broker." Many members of MIT would be considered strategic brokers.

## MANAGING TECHNOLOGY

To this point, we have discussed the business environment of today. We discussed how companies might be organized to deal with the competitive challenge. But before embarking on a program of obtaining strategic alliances and finding technologies, selling technologies, acquiring market channels, and the like, a company must understand what technological assets it has in its inventory and how to manage these assets strategically.

Many companies have a significant inventory of technology. The term "technology" does not mean simply patents and patent applications, copyrights, trademarks, but all other technology in recognizable form such as assembly information, parts lists, quality control procedures, etc.

A company will also have a significant inventory of complementary assets. A complementary asset is not something that normally can be presented in recorded form. A complementary asset might be a marketing channel to hospital emergency rooms. Another might be a precision machining capability. A stocker might be a reputation for quality in a territory.

But these technology assets and complementary assets are potentially not valued and not employed to generate maximum return. One cause is that traditional financial accounting practices do not reflect a value of investment cost of technology assets or complementary assets. Because these assets do not fit on a balance sheet, many often think that they tend not to be managed in any fashion. Many companies do not have any individuals assigned the responsibility for managing the total technology and complementary

asset portfolios and have their core processes tied to that performance.

This structure was recognized by Michael Holsang, a technology columnist for the Los Angeles Times, when he observed in his columns in April 1993, "At precisely the time when people are recognizing the value and importance of intellectual property as a key ingredient in global competition, accounting rules typically forbid them from acknowledging that."

Accordingly, if a company can manage intellectual capital better than its competitors, it will have a tremendous advantage in the New Economy. Techniques for mapping of technology assets and complementary assets have resulted from research of Professor David Foray of the University of California and extended by his colleague, Patrick Sullivan.

It is useful to consider the process of mapping technology and complementary assets as a four-step process. These steps are as follows:

1. Conduct a comprehensive mapping of technology assets and complementary assets.
2. Compare the results of this mapping with the needs of the stated business strategy. This will result in the determination of missing technology assets, missing technology assets, missing complementary assets, and under-utilized or surplus complementary assets.
3. Analyze the results of Step 2, and develop strategies for acquiring, creating, or better leveraging the company's technology assets and complementary assets.

This step can be illustrated by Figure 5.

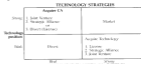


Figure 5

aged technology-based companies have been less successful than those without such training. Of course, there have been notable exceptions.

It is important to note what the CTO is not. The CTO is not responsible for corporate research, marketing, finance, manufacturing or other typical corporate functions. The main focus of the CTO is technology management.

In many cases, a company will wish to turn to third-party experts to carry out all four steps with the corporate responsibility and direction, of course, remaining with the CTO. This use of specialized expertise will make business sense for the company when the strategic deter-

mination is to develop a technology asset and/or complementary asset or to leverage a technology asset or complementary asset into a business direction that is not in the corporate strategy. It will not make sense for the company to develop expertise for markets it does not intend to serve. Here, we can turn again to the virtual concept, where a team is rapidly assembled to accomplish the business need and then dismantled once the need has been accomplished.

#### TECHNOLOGY: THE TRADEABLE VALUE OF THIS AGE

In the past, important centers of

commerce developed where trade routes crossed. These developed by major routes of communication such as the Great Silk Road, at the confluence of major rivers, and strategically located ocean ports.

Today's trade routes are increasingly technology, and the trade routes are the myriad of telecommunication channels and are instantly traveled.

Strategic management of technology is increasingly critical to the survival of companies in this New Economy. The companies that best manage their technology assets and complementary assets will be the companies that survive.