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Gedas A. Sakus

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The Power of Technology, The Challenge of Innovation

*Gedas A. Sakus**

As I look ahead, I see an environment in which rapid change will be an everyday fact of doing business. Firms will have to deal with changes in the way they think about and serve markets, and changes in the way companies organize to ensure growth. Information is becoming our most precious commodity. It is the raw material that will sustain economic growth in the twenty-first century.

More than three centuries ago, English philosopher and essayist Francis Bacon noted that "Knowledge itself is power." Were he around today, I suspect he would revise that observation to reflect the new reality that knowledge creates wealth. Information technologies are among the most aggressive technologies of our time, generating progress, change, and discontinuity in all sectors of the economy. Just as coal fueled the transformation to an industrial society, so information technology is powering the rise of the Information Age.

The constantly growing power of information technologies offers the means to forge competitive advantage on a worldwide scale. Companies that recognize this pervasive change are making substantial investments in research and development in order to turn information technology into competitive advantage. They are positioning themselves to prosper in the global economy that the Information Age is shaping. If a firm chooses to ignore this new business environment, it will see its market share erode and ultimately disappear. On the other hand, management of change can create new value for new markets and secure a prosperous future. The obvious choice is the second approach: facing up to the challenges and making them work to an advantage.

I would like to concentrate on three issues crucial for ensuring a competitive future: the power of technology, the challenge of innovation, and the management of competitive strategies. Let me make an important distinction. Though they are sometimes used as synonyms, technology and innovation are not identical. Technology is generated by scientific knowledge. Its availability depends on the quality of an individual's, an organization's, or a nation's inventory of such knowledge. But customers do not buy technology. They buy what it can do for them. Thus, the key to the application of technology is innovation, the value-added conversion of new technology into conspicuous customer so-

* President, Bell-Northern Research.

lutions. Innovation can involve new products, new processes, or new services.

North America may still lead in the ownership of technology and new scientific knowledge, but in many cases, our success in applying innovation has been seriously eroded, if not already surpassed by other countries. For more than 20 years, productivity growth in North America has lagged when compared to foreign competitors. From 1960-85, the average annual productivity growth for the United States was 1.3% and in Canada, 1.9%. During the same period, West Germany's productivity growth rate reached 3.2%, and Japan's was 5.6%. Since that time, the gap has begun to narrow. However, U.S. and Canadian performance is still less than that of Japan and the European Community.

All of us recognize the seriousness of lagging productivity. We know that such comparisons are becoming increasingly more important all the time. As the theme of this conference highlights, competition is increasingly global. The term "foreign markets" is rapidly becoming a redundant expression. The world is now one sales territory. Many of our competitors in Europe and in the Pacific Rim have learned that lesson well. Competition cannot be avoided simply by staying within the boundaries of traditional markets.

A strategic global focus is one of the reasons for the success of Bell-Northern Research ("BNR") and of its parent company, Northern Telecom. Products using our digital telecommunications technology are now in place in more than seventy countries around the world. We are in a dynamic and competitive business. It has all been made possible by the rising power of information technology.

I. THE POWER OF TECHNOLOGY

Two years ago, John Roth, my predecessor as president of BNR, addressed this group on the challenge of managing with technology. John's message was that North American businesses can compete successfully in the world economy, but only if we learn to effectively apply the technologies that we have created.

The importance of meeting that challenge has deepened and intensified in the last two years. The power and reach of technology is growing with increasing force. Information and its supporting technologies are acquiring daily a greater ability to determine economic success. This is an age of discontinuity, a period in which the success and prosperity of industries and, indeed, of entire nations, are increasingly dependent on the effective use of information technology. For example, robots, computer aided designs, and flexible manufacturing systems are creating the capability for computer-controlled factories. In Saginaw, Michigan, General Motors' new automated front axle plant will be run entirely by robots during part of each working day.

The key components of information technology are computing and telecommunications, and they have become major markets. The global market for telecommunications equipment and associated services is forecasted to expand from about \$75 billion in 1987 to approximately \$300 billion in the year 2000, a growth rate unmatched by any other industry. Another aspect of telecommunications and computing technologies is that they are rapidly merging, creating a true Information Age in which traditional business strategies are quickly becoming obsolete. Consider the following: the amount of memory that can be fitted onto a silicon chip is doubling every three years while the price per function falls by half; the development was recently announced of a gallium arsenide circuit that can handle signals at five billion cycles per second. At this speed it would take less than one second to transmit the contents of the entire thirty-two volume *Encyclopedia Britannica* through its circuitry. The power of microprocessors measured in millions of instructions per second ("MIPs"), is increasing exponentially. According to a Booz-Allen & Hamilton study, there are more available raw MIPs today on the desks in major corporations in the form of personal computers than in the mainframes.

Information technologies are transforming technologies. They constantly reshape the competitive landscape, accelerating technical change through every part of the global economy. These technologies present significant challenges in retaining current customers and unparalleled opportunities for winning new ones. Information technologies are changing the structure of entire industries by removing the barriers of time and location to encourage global operations and competitiveness.

These new technologies are changing the way the manufacturing sector conducts business just as radically as they are changing the character of the service industries. It has been predicted that as much as eighty percent of all manufacturing industries and a large portion of all service industries will see major technological changes before the year 2000. None are immune to the changes driven by the spread of information technology. However, as impressive and powerful as these tools are, they still remain tools: products and services that offer the potential for doing things better. To generate true competitive advantage, technology must be applied.

II. THE CHALLENGE OF INNOVATION

Innovation is not linked exclusively to high-technology fields. Rather it is the application of new knowledge to a product, process or service in any field or industry. Successful innovation requires more than good ideas. The hard part is understanding the appropriateness of individual ideas, assessing their market potential, and converting them into real business opportunities. Above all, innovation concerns the matching of new technology to the solution of a problem.

Early market estimates indicated that only 5,000 Xerox machines would ever be sold and that the total market for computers would be no more than 300 units. With the benefit of hindsight, it is easy to smile at those predictions; but there is also a lesson: innovation has a remarkable capability for surprising those who believe that tomorrow's marketplace will be pretty much like today's. No matter what the business is, technology is changing it. For example, in the case of BNR and Northern Telecom, about eighty percent of our revenues today are generated by products and system features that did not exist in 1980.

To extract the maximum rewards from innovation, businesses must not only create value for customers, they must also build an organization capable of bringing products and services to the market in a manner that preempts the competition. With a virtually common base of knowledge, new market penetration and comparative advantage increasingly depend on the uniqueness of technology applications, and the speed with which they are delivered to the marketplace. Innovation holds the key to North American competitiveness in the twenty-first century. It is the most crucial prerequisite for ensuring our future prosperity. Meeting this challenge is going to be a difficult, but exciting, proposition.

There are a number of approaches to managing innovation, but let me make a few observations on how we might best focus our innovative strategies for the future. I want to briefly look at the three issues: value, velocity, and vision.

The creation of value is the prime criterion for applying innovation effectively. The first consideration is finding and recruiting people who have the knowledge and the commitment to break new ground. As Peter Drucker has noted in *The Frontiers of Management*, "Smart companies know that money does not produce innovation; people do. They know that in innovative work, quality counts far more than quantity. They do not spend a penny unless there is a first-rate person to do the work."

Finding and training the best people possible is one primary test of success. For any business, maintaining an effective research and development strategy begins with an investment in intellectual capital. However, here again, North America has been slow to respond. The population of Japan is less than half that of Canada and the United States. Nevertheless, in Japan about the same number of engineers graduate each year as in North America.

If we are serious about meeting the challenge of innovation, each of us in business and industry must take a personal interest in improving the educational system. This can be done by participating with universities in independent research centers; making strategic, targeted investments in universities such as the establishment of special chairs in specific fields; and setting up cooperative work programs in businesses for outstanding students. As we move further into the Information Age, we must have more and better graduates who can create value through inno-

vation. They will also need to understand the competitive environment that will decide the success or failure of the innovations they design.

The second major strategy for ensuring future competitiveness in North America is velocity. Since technology is advancing so rapidly, keeping up with it is like trying to change the tires of a moving car. The speed with which innovation is introduced can often be a crucial determinant of competitive success. As technology grows in power and scope, competition grows more intense. With the proliferation of new customer products and services, businesses will need to be more ingenious to maintain market share, let alone enlarge it.

In fact, there is a need more and more for innovation to be managed as a continuous process. Meeting that need will require developing the organization and the systems to move quickly and decisively. A few approaches are: multidisciplinary teams with designers, manufacturing experts, and marketeers all working together during the new product development cycle; using the same kind of team approach in working with customers in their offices and factories to ensure that proposed solutions really match their most important problems; and tightening processes to avoid repetition and making speed a prerequisite for new product introduction.

BNR serves a worldwide telecommunications market. To do this effectively, labs are maintained in nine locations (three in Canada, five in the United States, and one in the United Kingdom). All of these labs are linked by a corporate-wide network, allowing universal access to a common and constantly expanding knowledge base. Each business day three gigabytes of information pass through this system. That's equivalent to 700,000 pages of information. Other companies have taken a similar approach. Boeing and Otis Elevator now electronically pass product design information between units in different countries. But more companies, including those that most people would not designate as high-technology, need to understand the advantages of speed and responsiveness that such systems can provide.

Avoiding bureaucracy and needless repetition can play a key role in keeping the "design to market" cycle as short as possible. The problem is that many of these administrative systems will not provide sufficient speed and flexibility to compete in tomorrow's markets. It is never easy to change something that does not seem to need it, but this will be one of the key innovative challenges for the future: to experiment with and refine new ways of doing things before the old ways lead to serious problems.

One of the key challenges will be to adopt innovation in planning a business. This is the third focus for innovation: vision. It is probably the most difficult of the three issues. Acquiring a true innovative vision, and then living it, will mean going a long way into unexplored territory. It will be a constant challenge to reshape internal structures and the way they work.

In a recent issue of the *Harvard Business Review*, Peter Drucker speculated on how a typical large business will be organized in 2008. He predicted that such a company will have fewer than half the levels of management of its 1988 counterpart and no more than a third of its managers. Drucker's paradigms for the successful business of 2008 are the hospital, the university, and the symphony orchestra. For like these models, he observes, ". . . the typical business will be knowledge based, an organization composed largely of specialists who direct and discipline their performance through organized feedback from colleagues, customers, and headquarters."

No matter what shape the successful business of tomorrow will take, flexibility will be an absolute necessity for competitiveness. The ability to exploit opportunities quickly will be of supreme value. As change intensifies, many traditionally successful businesses will be forced to substantially alter their market approaches. Some companies will disappear. Others will be established. In this fluid environment, major discontinuities will occur with increasing frequency. Some organizations will see this trend as a problem or even a threat. Others, the successful enterprises, will appreciate the opportunities for growth that such conditions provide.

Already the effects of information technology and of market-driven innovation are being seen. For example: the major auto manufacturers have forecast that by the mid-1990s, the value of on-board electronics will account for fifteen to thirty-six percent of the value of a new car. Airlines are finding that their data bases present new opportunities for profitability. The successful marketing of information on routing and reservations could lead some airlines to invest in the travel agency business. Competition among financial service companies is increasingly driven by worldwide information systems and electronic funds transfer systems. The scanner readable bar codes in supermarkets are proving to have value beyond merely providing faster checkouts. Tighter inventory control and expedited shipping are just two improvements, and more are expected. In fact, industrial coding systems have experienced increased growth in sales of forty to sixty percent in recent years. The market is expected to be worth a billion dollars by 1990, a huge increase from the \$170 million figure for 1984.

III. CONCLUSION

All of these changes are being driven by the power of information technology and the opportunity of innovation. As businesses further exploit this great potential, they will likewise begin to alter the way they compete. They will form specific networks and alliances with other businesses to combine different market strengths. They will institute frequent product and service probes to test potential new markets. Continuous innovation will be used as a regular business skill and speed

to market as a strategic competitive weapon. Above all, successful organizations will develop and maintain an appetite for going on the attack and pursuing absolute leadership within an industry.

It's an exciting time to be in business. We're on the threshold of a world in which technology and innovation will bring enormous dividends to those who can create, manage, and apply them effectively. All of us throughout North American business and industry share the responsibility of meeting that challenge. We also share the means of doing so.

Andre Heiniger, the chairman of Rolex, was once asked how things were going in the watch business. "I have no idea," he replied, "Rolex is not in the watch business. We are in the luxury business." Each of us is in the innovation business. The skill and effectiveness with which we apply that discipline will determine the future competitiveness of North American business and industry and our ultimate prosperity in the twenty-first century.

