How information gives you competitive advantage

Michael E. Porter and Victor E. Millar

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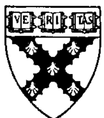

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The information revolution is tranforming the nature of competition

How information gives you competitive advantage

Michael E. Porter and Victor E. Millar

It is hard to overestimate the strategic significance of the new information technology. This technology is transforming the nature of products, processes, companies, industries, and even competition itself. Until recently, most managers treated information technology as a support service and delegated it to EDP departments. Now, however, every company must understand the broad effects and implications of the new technology and how it can create substantial and sustainable competitive advantages.

The authors of this article provide a useful framework for analyzing the strategic significance of the new information technology. They show how and why the technology is changing the way companies operate internally as well as altering the relationships among companies and their suppliers, customers, and rivals. They go on to identify three specific ways that the technology affects competition: it alters industry structures, it supports cost and differentiation strategies, and it spawns entirely new businesses. They outline five steps to help managers assess the impact of the information revolution on their own companies.

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The information revolution is sweeping through our economy. No company can escape its effects. Dramatic reductions in the cost of obtaining, processing, and transmitting information are changing the way we do business.

Most general managers know that the revolution is under way, and few dispute its importance. As more and more of their time and investment capital is absorbed in information technology and its effects, executives have a growing awareness that the technology can no longer be the exclusive territory of EDP or IS departments. As they see their rivals use information for competitive advantage, these executives recognize the need to become directly involved in the management of the new technology. In the face of rapid change, however, they don't know how.

This article aims to help general managers respond to the challenges of the information revolution. How will advances in information technology affect competition and the sources of competitive advantage? What strategies should a company pursue to exploit the technology? What are the implications of actions that competitors may already have taken? Of the many opportunities for investment in information technology, which are the most urgent?

To answer these questions, managers must first understand that information technology is more than just computers. Today, information technology must be conceived of broadly to encompass the information that businesses create and use as well as a wide spectrum of increasingly convergent and linked technologies that process the information. In addition to computers, then, data recognition equipment, com-

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munications technologies, factory automation, and other hardware and services are involved.

The information revolution is affecting competition in three vital ways:

It changes industry structure and, in so doing, alters the rules of competition.

It creates competitive advantage by giving companies new ways to outperform their rivals.

It spawns whole new businesses, often from within a company's existing operations.

We discuss the reasons why information technology has acquired strategic significance and how it is affecting all businesses. We then describe how the new technology changes the nature of competition and how astute companies have exploited this. Finally, we outline a procedure managers can use to assess the role of information technology in their business and to help define investment priorities to turn the technology to their competitive advantage.

Strategic significance

Information technology is changing the way companies operate. It is affecting the entire process by which companies create their products. Furthermore, it is reshaping the product itself: the entire package of physical goods, services, and information companies provide to create value for their buyers.

An important concept that highlights the role of information technology in competition is the "value chain."[1] This concept divides a company's activities into the technologically and economically distinct activities it performs to do business. We call these "value activities." The value a company creates is measured by the amount that buyers are willing to pay for a product or service. A business is profitable if the value it creates exceeds the cost of performing the value activities. To gain competitive advantage over its rivals, a company must either perform these activities at a lower cost or perform them in a way that leads to differentiation and a premium price (more value).[2]

A company's value activities fall into nine generic categories (see *Exhibit I*). Primary activities are those involved in the physical creation of the product, its marketing and delivery to buyers, and its support and servicing after sale. Support activities provide the inputs and infrastructure that allow the primary activities to take place. Every activity employs purchased inputs, human resources, and a combination of technologies. Firm infrastructure, including such functions as general management, legal work, and accounting, supports the entire chain. Within each of these generic categories, a company will perform a number of discrete activities, depending on the particular business. Service, for example, frequently includes activities such as installation, repair, adjustment, upgrading, and parts inventory management.

A company's value chain is a system of interdependent activities, which are connected by linkages. Linkages exist when the way in which one activity is performed affects the cost or effectiveness of other activities. Linkages often create trade-offs in performing different activities that should be optimized. This optimization may require trade-offs. For example, a more costly product design and more expensive raw materials can reduce after-sale service costs. A company must resolve such trade-offs, in accordance with its strategy, to achieve competitive advantage.

Linkages also require activities to be coordinated. On-time delivery requires that operations, outbound logistics, and service activities (installation, for example) should function smoothly together. Good coordination allows on-time delivery without the need for costly inventory. Careful management of linkages is often a powerful source of competitive advantage because of the difficulty rivals have in perceiving them and in resolving trade-offs across organizational lines.

The value chain for a company in a particular industry is embedded in a larger stream of activities that we term the "value system" (see *Exhibit II*). The value system includes the value chains of suppliers, who provide inputs (such as raw materials, components, and purchased services) to the company's value chain. The company's product often passes through its channels' value chains on its way to the ultimate buyer. Finally, the product becomes a purchased input to the value chains of its buyers, who use it to perform one or more buyer activities.

Linkages not only connect value activities inside a company but also create interdependencies between its value chain and those of its suppliers and channels. A company can create competitive advantage by optimizing or coordinating these links to the outside. For example, a candy manufacturer may save processing steps by persuading its suppliers to deliver chocolate in liquid form rather than in molded bars. Just-in-time deliveries by the supplier may have the same effect. But the opportunities for savings through coordinating with suppliers and channels go far beyond logistics and order processing. The company, suppliers, and channels can all benefit through better recognition and exploitation of such linkages.

Competitive advantage in either cost or differentiation is a function of a company's value

Exhibit I **The value chain**

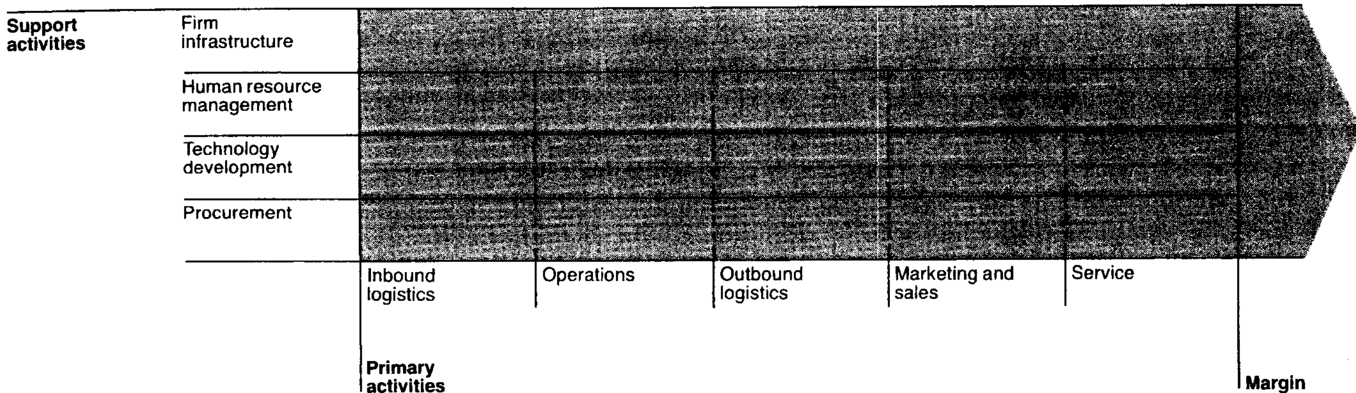
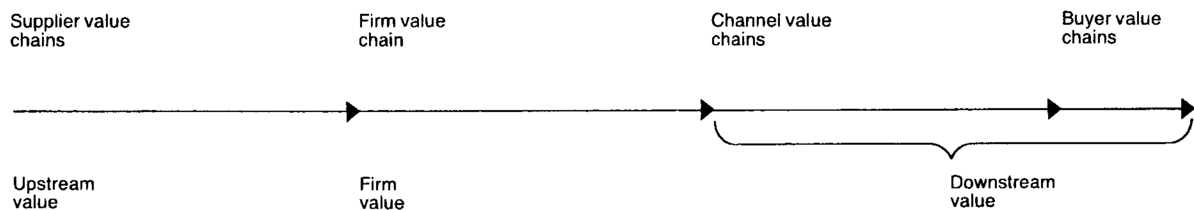


Exhibit II **The value system**



chain. A company's cost position reflects the collective cost of performing all its value activities relative to rivals. Each value activity has cost drivers that determine the potential sources of a cost advantage. Similarly, a company's ability to differentiate itself reflects the contribution of each value activity toward fulfillment of buyer needs. Many of a company's activities – not just its physical product or service – contribute to differentiation. Buyer needs, in turn, depend not only on the impact of the company's product on the buyer but also on the company's other activities (for example, logistics or after-sale services).

In the search for competitive advantage, companies often differ in competitive scope – or the breadth of their activities. Competitive scope has four key dimensions: segment scope, vertical scope (degree of vertical integration), geographic scope, and industry scope (or the range of related industries in which the company competes).

Competitive scope is a powerful tool for creating competitive advantage. Broad scope can allow the company to exploit interrelationships between the value chains serving different industry segments, geographic areas, or related industries. For example, two business units may share one sales force to sell their products, or the units may coordinate the procurement of common components. Competing nationally or globally with a coordinated strategy can yield a competitive advantage over local or domestic rivals. By employing a broad vertical scope, a company can exploit the potential benefits of performing more activities internally rather than use outside suppliers.

By selecting a narrow scope, on the other hand, a company may be able to tailor the value chain to a particular target segment to achieve lower cost or differentiation. The competitive advantage of a narrow scope comes from customizing the value chain to best serve particular product varieties, buyers, or geographic regions. If the target segment has unusual needs, broad-scope competitors will not serve it well.

Transforming the value chain

Information technology is permeating the value chain at every point, transforming the way value activities are performed and the nature of the

linkages among them. It also is affecting competitive scope and reshaping the way products meet buyer needs. These basic effects explain why information technology has acquired strategic significance and is different from the many other technologies businesses use.

Every value activity has both a physical and an information-processing component. The physical component includes all the physical tasks required to perform the activity. The information-processing component encompasses the steps required to capture, manipulate, and channel the data necessary to perform the activity.

Every value activity creates and uses information of some kind. A logistics activity, for example, uses information like scheduling promises, transportation rates, and production plans to ensure timely and cost-effective delivery. A service activity uses information about service requests to schedule calls and order parts, and generates information on product failures that a company can use to revise product designs and manufacturing methods.

An activity's physical and information-processing components may be simple or quite complex. Different activities require a different mix of the two components. For instance, metal stamping uses more physical processing than information processing; processing of insurance claims requires just the opposite balance.

For most of industrial history, technological progress principally affected the physical component of what businesses do. During the Industrial Revolution, companies achieved competitive advantage by substituting machines for human labor. Information processing at that time was mostly the result of human effort.

Now the pace of technological change is reversed. Information technology is advancing faster than technologies for physical processing. The costs of information storage, manipulation, and transmittal are falling rapidly and the boundaries of what is feasible in information processing are at the same time expanding. During the Industrial Revolution, the railroad cut the travel time from Boston, Massachusetts to Concord, New Hampshire from five days to four hours, a factor of 30.[3] But the advances in information technology are even greater. The cost of computer power relative to the cost of manual information processing is at least 8,000 times less expensive than the cost 30 years ago. Between 1958 and 1980 the time for one electronic operation fell by a factor of 80 million. Department of Defense studies show that the error rate in recording data through bar coding is 1 in 3,000,000, compared to 1 error in 300 manual data entries.[4]

This technological transformation is expanding the limits of what companies can do faster than managers can explore the opportunities. The information revolution affects all nine categories of value activity, from allowing computer-aided design in technology development to incorporating automation in warehouses (see *Exhibit III*). The new technology substitutes machines for human effort in information processing. Paper ledgers and rules of thumb have given way to computers.

Initially, companies used information technology mainly for accounting and record-keeping functions. In these applications, the computers automated repetitive clerical functions such as order processing. Today information technology is spreading throughout the value chain and is performing optimization and control functions as well as more judgmental executive functions. General Electric, for instance, uses a data base that includes the accumulated experience and (often intuitive) knowledge of its appliance service engineers to provide support to customers by phone.

Information technology is generating more data as a company performs its activities and is permitting it to collect or capture information that was not available before. Such technology also makes room for a more comprehensive analysis and use of the expanded data. The number of variables that a company can analyze or control has grown dramatically. Hunt-Wesson, for example, developed a computer model to aid it in studying distribution-center expansion and relocation issues. The model enabled the company to evaluate many more different variables, scenarios, and alternative strategies than had been possible before. Similarly, information technology helped Sulzer Brothers' engineers improve the design of diesel engines in ways that manual calculations could not.

Information technology is also transforming the physical processing component of activities. Computer-controlled machine tools are faster, more accurate, and more flexible in manufacturing than the older, manually operated machines. Schlumberger has developed an electronic device permitting engineers to measure the angle of a drill bit, the temperature of a rock, and other variables while drilling oil wells. The result: drilling time is reduced and some well-logging steps are eliminated. On the West Coast, some fishermen now use weather satellite data on ocean temperatures to identify promising fishing grounds. This practice greatly reduces the fishermen's steaming time and fuel costs.

Information technology not only affects how individual activities are performed but, through new information flows, it is also greatly enhancing a company's ability to exploit linkages between activities, both within and outside the company. The technology is creating new linkages between activities, and companies can now coordinate their actions more closely with those of their buyers and suppliers. For example, McKesson, the nation's largest drug distributor,