

INFORMATION SYSTEMS, ORGANIZATIONS, AND STRATEGY II

9.1 HOW INFORMATION SYSTEMS IMPACT ORGANIZATIONS AND BUSINESS FIRMS

Information systems have become integral, online, interactive tools deeply involved in the minute-to-minute operations and decision making of large organizations. Over the last decade, information systems have fundamentally altered the economics of organizations and greatly increased the possibilities for organizing work. Theories and concepts from economics and sociology help us understand the changes brought about by IT.

ECONOMIC IMPACTS From the point of view of economics, IT changes both the relative costs of capital and the costs of information. Information systems technology can be viewed as a factor of production that can be substituted for traditional capital and labor. As the cost of information technology decreases, it is substituted for labor, which historically has been a rising cost. Hence, information technology should result in a decline in the number of middle managers and clerical workers as information technology substitutes for their labor (Laudon, 1990). As the cost of information technology decreases, it also substitutes for other forms of capital, such as buildings and machinery, which remain relatively expensive. Hence, over time we should expect managers to increase their investments in IT because of its declining cost relative to other capital investments. IT also obviously affects the cost and quality of information and changes the economics of information. Information technology helps firms contract in size because it can reduce transaction costs—the costs incurred when a firm buys on the marketplace what it cannot make itself.

According to transaction cost theory, firms and individuals seek to economize on transaction costs, much as they do on production costs. Using markets is expensive (Coase, 1937; Williamson, 1985) because of costs such as locating and communicating with distant suppliers, monitoring contract compliance, buying insurance, obtaining information on products, and so forth. Traditionally, firms have tried to reduce transaction costs through vertical integration, by getting bigger, hiring more employees, and buying their own suppliers and distributors, as both General Motors and Ford used to do. Information technology, especially the use of networks, can help firms lower the cost of market participation (transaction costs), making it worthwhile for firms to contract with external suppliers instead of using internal sources. For instance, by using computer links to external suppliers, the Chrysler Corporation can achieve economies by obtaining more than 70

percent of its parts from the outside. Information systems make it possible for companies such as Cisco Systems and Dell Computer to outsource their production to contract manufacturers such as Flextronics instead of making their products themselves.

As transaction costs decrease, firm size (the number of employees) should shrink because it becomes easier and cheaper for the firm to contract for the purchase of goods and services in the marketplace rather than to make the product or offer the service itself. Firm size can stay constant or contract even if the company increases its revenues. For example, when Eastman Chemical Company split off from Kodak in 1994, it had \$3.3 billion in revenue and 24,000 full-time employees. By 2005, it generated \$7.1 billion in revenue with only 12,000 employees. Information technology also can reduce internal management costs. According to agency theory, the firm is viewed as a “nexus of contracts” among self-interested individuals rather than as a unified, profit-maximizing entity (Jensen and Meckling, 1976). A principal (owner) employs “agents” (employees) to perform work on his or her behalf. However, agents need constant supervision and management; otherwise, they will tend to pursue their own interests rather than those of the owners. As firms grow in size and scope, agency costs or coordination costs rise because owners must expend more and more effort supervising and managing employees.

THE TRANSACTION COST THEORY OF THE IMPACT OF INFORMATION TECHNOLOGY ON THE ORGANIZATION

Firms traditionally grew in size to reduce transaction costs. IT potentially reduces the costs for a given size, shifting the transaction cost curve inward, opening up the possibility of revenue growth without increasing size, or even revenue growth accompanied by shrinking size.

By reducing the costs of acquiring and analyzing information, permits organizations to reduce agency costs because it becomes easier for managers to oversee a greater number of employees. There have been examples where information technology expanded the power and scope of small organizations by enabling them to perform coordinating activities such as processing orders or keeping track of inventory with very few clerks and managers.

Theories based on the sociology of complex organizations also provide some understanding about how and why firms change with the implementation of new IT applications. IT Flattens Organizations Large, bureaucratic organizations, which

primarily developed before the computer age, are often inefficient, slow to change, and less competitive than newly created organizations. Some of these large organizations have down-sized, reducing the number of employees and the number of levels in their organizational hierarchies. Behavioral researchers have theorized that information technology facilitates flattening of hierarchies by broadening the distribution of information to empower lower-level employees and increase management efficiency. IT pushes decision-making rights lower in the organization because lower-level employees receive the information they need to make decisions without supervision. (This empowerment is also possible because of higher educational levels among the workforce, which give employees the capabilities to make intelligent decisions.)

9.2 THE AGENCY COST THEORY OF THE IMPACT OF INFORMATION TECHNOLOGY ON THE ORGANIZATION

As firms grow in size and complexity, traditionally they experience rising agency costs. IT shifts the agency cost curve down and to the right, enabling firms to increase size while lowering agency costs.

Management costs decline as a percentage of revenues, and the hierarchy becomes much more efficient. These changes mean that the management span of control has also been broadened, enabling high-level managers to manage and control more workers spread over greater distances. Many companies have eliminated thousands of middle managers as a result of these changes. Postindustrial Organizations Postindustrial theories based more on history and sociology than economics also support the notion that IT should flatten hierarchies. Information systems can reduce the number of levels in an organization by providing managers with information to supervise larger numbers of workers and by giving lower-level employees more decision-making authority.

Many new information systems require changes in personal, individual routines that can be painful for those involved and require retraining and additional effort that may or may not be compensated. Because information systems potentially change an organization's structure, culture, business processes, and strategy, there is often considerable resistance to them when they are introduced. There are several ways to visualize organizational resistance. Leavitt (1965) used a diamond shape to illustrate the interrelated and mutually adjusting character of technology and organization. Here, changes in technology are absorbed, deflected, and defeated by organizational task arrangements, structures, and people. In this model, the only way to bring about change is to change the technology, tasks, structure, and people simultaneously.

9.3 THE INTERNET AND ORGANIZATIONS The Internet, especially the World Wide Web, is beginning to have an important impact on the relationships between firms and external entities, and even on the organization of business processes inside a firm. The Internet increases the accessibility, storage, and distribution of information and knowledge for organizations. In essence, the Internet is capable of dramatically lowering the transaction and agency costs facing most organizations. For instance, brokerage firms and banks in New York can now deliver their internal operations procedures manuals to their employees at distant locations by posting them on the corporate Web site, saving millions of dollars in distribution costs. A global sales force can receive nearly instant price product information updates using the Web or instructions from management sent by e-mail. Vendors of some large retailers can access retailers' internal Web sites directly to find up-to-the-minute sales information and to initiate replenishment orders instantly. Businesses are rapidly rebuilding some of their key business processes based on Internet technology and making this technology a key component of their IT infrastructures. If prior networking is any guide, one result will be simpler business processes, fewer employees, and much flatter organizations than in the past.

IMPLICATIONS FOR THE DESIGN AND UNDERSTANDING OF INFORMATION SYSTEMS: To deliver genuine benefits, information systems must be built with a clear understanding of the organization in which they will be used. In our experience, the central organizational factors to consider when planning a new system are the following:

- The environment in which the organization must function
- The structure of the organization: hierarchy, specialization, routines, and business processes
 - The organization's culture and politics
 - The type of organization and its style of leadership
 - The principal interest groups affected by the system and the attitudes of workers who will be using the system
 - The kinds of tasks, decisions, and business processes that the information system is designed to assist

USING INFORMATION SYSTEMS TO ACHIEVE COMPETITIVE ADVANTAGE

In almost every industry you examine, you will find that some firms do better than most others. There's almost always a stand-out firm. In the automotive industry, Toyota is considered a superior performer. In pure online retail, Amazon.com is the leader. In off-line retail Wal-Mart, the largest retailer on earth, is the leader. In

online music, Apple's iTunes is considered the leader with more than 75 percent of the downloaded music market, and in the related industry of digital music players, the iPod is the leader. In Web search, Google is considered the leader. Firms that "do better" than others are said to have a competitive advantage over others: They either have access to special resources that others do not, or they are able to use commonly available resources more efficiently—usually because of superior knowledge and information assets. In any event, they do better in terms of revenue growth, profitability, or productivity growth (efficiency), all of which ultimately in the long run translate into higher stock market valuations than their competitors. But why do some firms do better than others and how do they achieve competitive advantage? How can you analyze a business and identify its strategic advantages? How can you develop a strategic advantage for your own business? And how do information systems contribute to strategic advantages? One answer to that question is Michael Porter's competitive forces model.

New Market Entrants: In a free economy with mobile labor and financial resources, new companies are always entering the marketplace. In some industries, there are very low barriers to entry, whereas in other industries, entry is very difficult. For instance, it is fairly easy to start a pizza business or just about any small retail business, but it is much more expensive and difficult to enter the computer chip business, which has very high capital costs and requires significant expertise and knowledge that is hard to obtain. New companies have several possible advantages: They are not locked into old plants and equipment, they often hire younger workers who are less expensive and perhaps more innovative, they are not encumbered by old, worn-out brand names, and they are "more hungry" (more highly motivated) than traditional occupants of an industry.

These advantages are also their weakness: They depend on outside financing for new plants and equipment, which can be expensive; they have a less experienced workforce; and they have little brand recognition. Substitute Products and Services In just about every industry, there are substitutes that your customers might use if your prices become too high. New technologies create new substitutes all the time. Even oil has substitutes: Ethanol can substitute for gasoline in cars; vegetable oil for diesel fuel in trucks; and wind, solar, coal, and hydro power for industrial electricity generation. Likewise, Internet telephone service can substitute for traditional telephone service, and fiber-optic telephone lines to the home can substitute for cable TV lines. And, of course, an Internet music service that allows you to download music tracks to an iPod is a substitute for CD-based music stores. The more substitute products and services in your industry, the less you can control pricing and the lower your profit margins.

How do you prevent substitutes and inhibit new market entrants? There are four generic strategies, each of which often is enabled by using information technology and systems: low-cost leadership, product differentiation, focus on market niche, and strengthening customer and supplier intimacy. **Low-Cost Leadership** Use information systems to achieve the lowest operational costs and the lowest prices. The classic example is Wal-Mart. By keeping prices low and shelves well stocked using a legendary inventory replenishment system, Wal-Mart became the leading retail business in the United States. Wal-Mart's continuous replenishment system sends orders for new merchandise directly to suppliers as soon as consumers pay for their purchases at the cash register. Point-of-sale terminals record the bar code of each item passing the checkout counter and send a purchase transaction directly to a central computer at Wal-Mart headquarters. The computer collects the orders from all Wal-Mart stores and transmits them to suppliers. Suppliers can also access Wal-Mart's sales and inventory data using Web technology. Because the system replenishes inventory with lightning speed, Wal-Mart does not need to spend much money on maintaining large inventories of goods in its own warehouses.

The system also enables Wal-Mart to adjust purchases of store items to meet customer demands. Competitors, such as Sears, have been spending 24.9 percent of sales on overhead. But by using systems to keep operating costs low, Wal-Mart pays only 16.6 percent of sales revenue for overhead. (Operating costs average 20.7 percent of sales in the retail industry.) Wal-Mart's continuous replenishment system is also an example of an efficient customer response system. An efficient customer response system directly links consumer behavior to distribution and production and supply chains. Wal-Mart's continuous replenishment system provides such an efficient customer response. Dell Computer Corporation's assemble-to-order system, described in the following discussion, is another example of an efficient customer response system.

Wal-Mart's continuous inventory replenishment system uses sales data captured at the checkout counter to transmit orders to restock merchandise directly to its suppliers. The system enables Wal-Mart to keep costs low while fine-tuning its merchandise to meet customer demands.

Product Differentiation Use information systems to enable new products and services, or greatly change the customer convenience in using your existing products and services. For instance, Google continuously introduces new and unique search services on its Web site, such as Google Maps. By purchasing PayPal, an electronic payment system, in 2003, eBay made it much easier for customers to pay sellers and expanded use of its auction marketplace. Apple

created iPod, a unique portable digital music player, plus a unique online Web music service where songs can be purchased for 99 cents. Continuing to innovate, Apple recently introduced a portable iPod video player. Manufacturers and retailers are using information systems to create products and services that are customized and personalized to fit the precise specifications of individual customers.

Dell Computer Corporation sells directly to customers using assemble-to-order manufacturing. Individuals, businesses, and government agencies can buy computers directly from Dell, customized with the exact features and components they need. They can place their orders directly using a toll-free telephone number or by accessing Dell's Web site. Once Dell's production control receives an order, it directs an assembly plant to assemble the computer using components from an on-site warehouse based on the configuration specified by the customer. Lands' End customers can use its Web site to order jeans, dress pants, chino pants, and shirts custom-tailored to their own specifications. Customers enter their measurements into a form on the Web site, which then transmits each customer's specifications over a network to a computer that develops an electronic made-to-measure pattern for that customer. The individual patterns are then transmitted electronically to a manufacturing plant, where they are used to drive fabric-cutting equipment. There are almost no extra production costs because the process does not require additional warehousing, production overruns, and inventories, and the cost to the customer is only slightly higher than that of a mass-produced garment. Fourteen percent of Lands' End shirt and pants sales are now customized. This ability to offer individually tailored products or services using the same production resources as mass production is called mass customization. Table 3-2 lists a number of companies that have developed IS-based products and services that other firms have found difficult to copy, or at least took a long time to copy.