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*The Changing Value of
Communications Technology*

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The Changing Value of Communication Technology

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Historically managers have viewed the correlation between a firm's telecommunications capabilities and success in the marketplace as insignificant. However, the emerging integration of computers and communications technology is expanding the realm of business opportunities. This paper presents a new framework to enhance managers' understanding of the business value and potential applications derived from these synergistic systems. *Ed.*

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It is no longer meaningful to talk about information processing and communications as independent activities. Parallel technological advances in both of these domains have given rise to a new generation of distributed information systems involving both processing and transmitting information. In these systems, the roles of computing and communicating are so intertwined that their **business value** depends on the total system, rather than on the separateness of the communications or processing function.

In this paper, we focus on the business opportunities made possible by these new synergistic Systems, which we call communications-intensive information systems (CIIS). Made up of processors, intelligent work stations, and terminals, the systems are interconnected by means of wide- and local-area networks. Although they may come in many forms, all communications technology systems are capable of rapidly transmitting information, in electronic form, between geographically dispersed sites and/or among separate organizational entities. In fact, the capabilities of these systems are becoming so widely recognized that many firms are now aggressively using them to improve their market positions, or to transform their products, services, and the industries in which they compete.' What managers lack, however, is a conceptual framework in which they can structure their search for, and subsequent evaluation of, such opportunities.

With this in mind, we present a framework that we believe will help managers understand the benefits and applications of CIIS technology in the context of their organizations. We also provide some basic guidelines for those companies that wish to exploit the opportunities made available by this technology. The model, which is technology independent and applications oriented, identifies three primary areas of **impact** for communications technology: compression of time, overcoming the restrictions of geography, and the restructuring of relationships. It also characterizes the business value of an information system in terms of increased operating efficiency, improved business effectiveness, or a basic transformation of a firm's business functions. Each impact-value pair defines a particular type of communications technology application and considers an attendant set of implementation Issues (see Figure 1).

		Value		
		Efficiency	Effectiveness	Innovation
Impact	Time	Accelerate Business Process	Reduce Information Float	Create Service Excellence
	Geography	Recapture Scale	Ensure Global Management Control	Penetrate New Markets
	Relationships	Bypass Intermediaries	Replicate Scarce Knowledge	Build Umbilical Cords

The Potential Impact

Time compression is the most immediate impact that a CIIS may have on an organization. Through clear communications links, information can be transmitted quickly between sites or organizational units. Consequently, the time required to perform a larger business process, of which information transmission is a part, may be reduced. For example, filling an order can be expedited by transmitting the order information from the field to the warehouse; or, management decision making can be made more efficient by electronically transmitting data directly from headquarters to a manager at a remote location.

Communications technology can also enable an organization to overcome limitations imposed by **geography**. Traditionally, extending an organization's activities into a new geographical area first required that the firm establish a major physical presence there. Doing so, however, can be expensive, cumbersome, and time-consuming. A CIIS that links a new territory to existing locations is an alternate way of expanding the firm's reach.

Finally, information technology can alter the structure of **organizational relationships** - both within the firm and between the firm and other entities. Since relationships are, in effect, defined by lines of communication, a CIIS can establish new relationships or dissolve old ones. For instance, a brokerage firm that allows customers to directly access a computerized database and order-placement system can lessen customers' dependence on a particular broker: the customers then become the firm's customers, not the broker's.

The Potential Business Value

The **business value** of information systems can be manifested in various ways, depending on the kind of value the firm seeks to provide its customers. Generically, a communications technology provides business value in three distinct areas: efficiency (increased productivity), effectiveness (better management), and innovation (improved products and services).

Increased **efficiency** is the application most familiar to managers, and the one with which organizations have the most experience. Most of the traditional applications-from payroll to order entry- are implemented to increase the efficiency of some internal processes. The resulting benefit is increased productivity, with either lowered costs for the existing level of transaction processing or avoided costs for increased volume processing.

Increased productivity, however, is not the only benefit that can be realized. Improved information access, resulting from better communications systems, can improve management **effectiveness**. For example, information technology can help ensure the availability of customer accounts information needed to support effective management decision making. While availability does not by itself guarantee management effectiveness, it is rapidly becoming a necessary competitive prerequisite.

Finally, information systems can bring about an *innovation* or enhancements to the quality of products and services, thereby improving the company's competitive position. A manufacturer, for instance, may allow its customers access to a work-in-process database to determine the status of their orders. Similarly, a distributor can give its customers systems that will allow them to manage their inventories more efficiently. In both cases, companies distinguish themselves from their competitors by means of the additional product/service quality made possible by this technology.

Impact/Value Framework

The two critical dimensions of *impact and value* can be used to define a framework for organizing and analyzing CIIS applications. Without this framework, the growing collection of well-known information technology cases simply represents folklore that won't help managers identify their own opportunities for exploiting this technology. The grid in Figure 1 provides a means of conceptualizing a wide variety of applications. The rows of the grid correspond to the three primary forms of Impact; the columns correspond to the three distinct classes of value.

A grid entry represents a unique kind of business change, that is, a vehicle by which impact is translated into value. Because a single CIIS may have multiple impacts on an organization and thus yield more than one kind of value, an application will seldom be described by a single entry (see Figure 1). In the following section, we consider specific applications in terms of their impact and business value to an organization.

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Making Use of Time Compression

Accelerate the Business Process. When communications technology accelerates a business process, the result is typically an increase in efficiency by decreasing the time required to perform a particular business process. Here, the firm's main objective is to reduce the labor costs incurred by information transactions and the costs of the business process itself.

A CIIS can also yield indirect efficiency improvements by increasing the accuracy of those business processes that require heavy information exchange, but which do not have quick communication feedback. Such processes are often susceptible to recording and transcription errors, which can either introduce delays when the errors are discovered or entail expensive and time-consuming error elimination controls. A CIIS can forestall such errors, and so contribute indirectly to process efficiency.

Opportunities for process acceleration may be found in those activities that are labor intensive, time critical, or correlated with business volume. Rand McNally & Company is a case in point. The company's 1983 acquisition of Infomap quickly became the focal point of Rand McNally's development of computer-based products. The customer provides the company with information to be mapped, and Rand McNally's system generates the customer map without further intervention.

Reduce Information Float. Time compression can also improve management decision making. In many firms, managers must base their decisions on incomplete and often obsolete data. Information technology can alleviate this problem by making data more rapidly available to decision makers. Here, time compression yields effectiveness rather than efficiency.

This phenomenon has been referred to as "reducing the information float" Often because the user of some information in an organization is not the producer of that information, significant time may elapse between the

production of the information and its communication to the user. Because of this 'float' the user may be employing inappropriate data. This occurs especially when data is of far less relevance to the producer than it is to the consumer. By linking the site that originates the information with the one that utilizes it, a CIIS can reduce, or even eliminate, the float. In doing so, an organization increases its potential to become information intensive and feedback sensitive.

Opportunities for reducing information float may be found in situations where key decisions depend on diffused data (e.g., information coming from multiple remote sources), or where quick feedback is essential. For example, the marketing management of a consumer products firm used to base its advertising and promotion strategies on historical sales information. Management's actions, however, were frequently inappropriate because of delays in gathering and disseminating the information. A communications technology system solved this problem. With the use of this system, the salespeople entered orders at the customer site (or at the branch office shortly after their return). The orders were then communicated immediately to a headquarters system for processing, and the sales data was aggregated and distributed through work stations made accessible by the marketing staff. Consequently, marketing managers could quickly assess the results of a promotion or an advertising campaign, determine its effectiveness, and decide how it should be altered.

Another example is Boehringer Ingelheim. The company uses a computer-based call reporting system that dramatically reduces the time needed to collect and analyze marketing data from the field.

Create Service Excellence. Communications technology can also increase the speed of the firm's operations as perceived by its customers, thereby improving customer service. A major international bank, for example, installed a worldwide communications system that allows loan applications originating in East Asia to be transmitted electronically to New York for analysis and approval. This resulted in a significant reduction in the time required to respond to loan requests. The bank used the responsiveness perceived by customers to establish an advantage over competitors who still used conventional, paper-based communications.

Superior service can also apply to increasing the speed of product delivery. By using a CIIS to speed order processing, or to manage inventories in a way that leads to fewer out-of-stock situations, a manufacturer or distributor can quickly deliver to a customer the product that has been requested. An actual example is Inventory Locator Service. This service allows air carriers to specify the parts they require for aircraft maintenance. When requested, the system automatically generates 'request for quotation' letters to potential suppliers.'

A CIIS can improve service quality not only by responding more quickly to customer inquiry but also by streamlining communication between the firm and the customer. Customers can use a single point of contact and obtain precise and current information. Such an arrangement can help eliminate, or at least diminish, confusing and frustrating communication problems that can destroy the relationship between firm and customer.

Clearly, opportunities for creating service excellence are found at key points of customer interaction, where responsiveness has high business value.

Overcoming Geographical Restrictions

Recapture Scale. One of the major problems with geographically dispersed organizations is that individual sites may not operate at a sufficiently high volume to benefit from economics of scale. By using a communications technology system, however, a collection of small, individual offices can operate as though they were one large organization. Such a system allows information to be transferred between remote units as readily and efficiently as can be done within a single physical site. The firm is thus able to lower its operational costs and still realize the benefits derived from geographically dispersed operations.

Target opportunities for scale recapture may be found in remote business processes that are susceptible to sudden increases in transaction volumes or that require specialized skills in order to provide full service. Warehouses, for instance, often maintain high contingency reserves because of uncertain demand. Moreover, it is difficult and time-

consuming to determine what items are at other warehouses. A CIIS that links the inventory data-bases of a collection of warehouses allows a distributor to share more readily reserves among them: the result is a lower aggregate inventory level in the warehouse system as a whole. Chrysler is one such example. AU of its manufacturing and assembly plants are tied into an information system that provides a fully interactive look at inventory on hand, material in transit, and upcoming material needs. The company claims that this dynamic inventory analysis system has helped cut inventory costs by more than \$700 million.'

Ensure Global Management Control. Another drawback of geographical dispersion is that management may have difficulty ensuring quality consistency across dispersed units. In other words, when an organization decentralizes its operations and resources, central quality control may become a problem. By means of a CIIS, however, rapid access to information on the performance of remote units can help corporate management monitor and redirect the activities of dispersed units. In this way uniformity and quality consistency are maintained throughout the organization.

Another problem arises because of local sub-optimization. Remotely located units tend to operate within the domain of their own physical and psychological boundaries, which often leads to actions aimed at satisfying their own needs. A CIIS can help to realign the goals of local units with those of corporate headquarters by providing remote subgroups with information about, and quick feedback on, the broader set of corporate concerns and objectives.

Target opportunities for global management control may be found in situations where a company's success requires the interdependent contribution of all its organizational entities, and where local, parochial actions need to be balanced against broader corporate goals.

Take, for example, General Electric's Materials & Plastics Division. The division developed ERIS (Engineering Resins Information System), which provides handbook information on all commercially available resins (not just GE's), helps the company's design engineers select materials, determines optimal processing conditions, and predicts manufacturing costs. In 1984 the system was also made available to outside customers, mostly to original equipment manufacturers (OEMs). Customers, however, cannot access ERIS directly; they work with trained GE marketing and technical personnel and use portable computers at the customers' sites.

Penetrate New Markets. The costs of geographical expansion can inhibit market penetration for many firms. Here again, a CIIS can help overcome these limitations and facilitate entry into new markets. A manufacturer can quickly open a new field office with only a skeleton staff: most of the support is received electronically through an information system at corporate headquarters. Similarly, for the customer who demands that all of his or her dispersed sites be serviced by a single vendor, an information system can create a logical presence by extending the capabilities of a field office, and thus qualify the firm with the customer. In both cases, geographical conquest by an information system translates into improvements in marketplace position.

Often, it is not physical limitations that restrict market entry, but rather legal or regulatory issues. A CIIS can be used to establish an electronic presence; therefore, regulatory restrictions - although changing laws may complicate this situation - can be overcome. In particular, financial service organizations have shown great ingenuity in projecting themselves into environments from which they might otherwise be barred. ATM networks also make it easier for firms to penetrate new markets.

Communications technology also enables a firm to enter new markets by expanding the time window during which it is allowed to do business on a national or international basis. A worldwide communications system allows a brokerage firm to operate in multiple trading markets effectively on a twenty-four-hour basis, thereby permitting its customers to place and execute orders at any time of the day.

Target opportunities of this class may be found in situations where customers require reporting and service nationally or globally; where physical presence is not economical or legal; or, where extending business hours across time zones would increase revenues. Citibank, in particular, has a global communications network that is used in its mergers and acquisition business. When the unit has a prospective seller, it frequently transmits data on the client to

some 7,000 Citibank officers around the world. By the time a brochure announcing the sale is published, the company may already have some prospective buyers.'

Restructuring Business Relationships

Bypass Intermediaries. A CIIS can widen the span of management control within a firm, thereby reducing the number of management layers. From the customer's perspective, such a system can obviate the need for 'translator' or expeditor intermediaries by permitting direct communication between originator and servicer. One such example is a customer who uses an on-line system to check the status of a previously placed order instead of asking the sales representative, who must then ask the plant manager.

Target opportunities for bypassing intermediaries may be found in cases where the cost of intervention or information handling is high (e.g., middle management in a hierarchical structure, or information brokering within a value-added chain). Here, the process is restructured and made more efficient. USAA illustrates this point. Since 1969, this San Antonio-based insurer has developed an extensive sales and marketing system that allows the company to conduct sales and service over the telephone. This eliminated the use of agents, who boost premiums. As a result, *Consumer Reports* ranked USAA at or near the top in customer satisfaction for its auto and homeowner claims handling."

Replicate Scarce Knowledge. Communications technology can have the effect of distributing knowledge within an organization, especially to remote locations. The effect may be expressed in terms of changes in relationships within the organization since knowledge no longer becomes the exclusive preserve of only a few individuals. The result is not greater process efficiency, but rather a more effective organization.

Replicating and distributing knowledge can also have a profound impact on the structure and culture of a company. Senior managers typically have access to scarce information, and so are presumed most capable of deciding critical issues. When such information is made more widely available to the entire organization, people at lower levels may more aggressively set their own directions. This leads to a revived entrepreneurial spirit within the firm: individual managers feel empowered by information access to resolve issues on their own.

For example, in an industrial products firm, sales information traditionally had been available only to senior, headquarters-based management (and even to them on a less than timely basis). The implementation of a CIIS led to the on-line availability of a sales database to branch sales managers. This provided them with an overall perspective, which had been previously unobtainable, on both salesman performance and product experience. They were now able to use this information to develop successful sales strategies explicitly targeted to their local markets; they did so with little guidance from corporate headquarters.

The exchange of knowledge made possible with communications technology leads to an interesting duality: regaining global control and moving power down an organizations hierarchy. This simultaneous centralization and decentralization may represent the best of both worlds." Through the distribution of information and knowledge, decision making is widely dispersed and driven down to levels closest to operations, customers, and their associated problems. Conversely, information technology also allows senior executives to monitor the 70 performance of these semi-independent decision makers. This enables them to identify problems at an early stage and to intervene where appropriate. In addition, a CIIS gives smaller and more dispersed units enough responsibility and autonomy without an organization jeopardizing its centralized control.

Target opportunities for this class may be found in situations where dispersed individuals require access to scarce knowledge or experience in order to respond to local markets. A case in point is Medicare-Glaser Corp. This company implemented an information system that warns a customer of potentially dangerous effects caused by the interaction of certain prescription drugs.

Build Umbilical Cords to Customers. The most celebrated communications technology applications are those that have been used to establish closer ties with customers. For example, a distributor placed order-entry terminals in the premises of small pharmacies. To be sure, one intent of this action was to increase the efficiency of the order-

entry process, from which both vendor and customer would benefit. However, it also strengthened the bond between the customer and the distributor by raising the customer's switching costs and tightening the distributor's hold. Once the link is established, this system can also serve as a distribution channel for additional products and services, which, in turn, can further tighten the vendor/customer bond.

An example of this is PIE Nationwide, Inc. The firm developed an information system for tracking shipments from origin to destination. Consequently, a customer may check on a shipment by accessing the PIE system, using his or her own terminal. Senior executives report that this system brings competitive advantage to PIE, because the company "stands out technologically in the trucking field" "

Guidelines for Action

The combination of communications and information processing offers a powerful vehicle for achieving critical business goals. However, many companies are ill equipped to exploit these opportunities. Following are basic actions that a firm must be willing to take in order to reposition itself and meet the communications technological challenge.

Reeducate Applications Staff. Applications planners should reorient their analysis activities to identify communications-intensive opportunities that have high **business value**. This reorientation requires quick learning about advances in information systems, as well as about the synergistic effects made possible by integrating communications and computing technologies.

Create a Technology Architecture. To support future information transport and connection needs, CIIS applications require a reliable technology infrastructure. To be effective, however, this infrastructure must provide compatibility among differing component technologies. The danger here is that, in light of the increasing rate of technology and business change, it may be unreasonable and risky to configure a network based purely on today's known needs. Similarly, extensive analysis aimed at anticipating all future requirements and constructing the 'Ideal' solution may just as easily result in paralysis and inaction.

Consolidate Communications Responsibilities. Identification and exploitation of leading-edge applications presuppose the effective deployment and management of communications technology. However, many organizations are still organized on the basis of historically distinct islands of information and communications systems management. Leadership responsibilities should be realigned under an "Information services director" to establish a critical mass of internal technical expertise, to provide a focal point for vendor management, to assimilate emerging technologies, and to ensure technical compatibility.

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