

ORGANIZATIONAL IMPACTS OF INFORMATION SYSTEMS USE

At Diamond Technology Partners, a management consulting firm headquartered in Chicago, Illinois, every consultant has a laptop with applications that allow him or her to tap into the company databases, complete administrative functions, work on projects, and communicate with others. Every staff member also has a computer at his or her disposal. Using the computer is fundamental to the way the company is organized, because every piece of information generated by every person in the organization is created, stored, and retrieved from the IS. Everyone can access the work done by everyone else, regardless of position or status in the company. Information needed to do a task is available to whoever needs it at the time and place they need it. For example, a consultant working with a major bottling company in Florida can access computer routines developed for a similar project for a utility company in Oregon. IS are integrated into every work function, which enables Diamond Technology Partners to operate under an organizational form different from its low-tech counterparts. Employees can sustain organizational activities usually reserved for colleagues collocated at the same physical site even when they are traveling around the world. They also can share information as if everyone was in the same office.

Consider another example. One of the earliest companies to make use of IS as part of designing its organization was Mrs. Fields Cookies. In the early 1980s, this company was managing cookie and bakery stores all over the world with a fraction of the management staff of other fast-food chain stores. Every store had a computer system that told the manager how many cookies batches to make, when to bake them, and when they would lack sufficient freshness for sale. The effect was a control mechanism similar to having founder Debbie Fields in each store ensuring the quality of her cookies. The information system went even further. It allowed Mrs. Fields to hire people whose skills were in selling cookies and not worry about

whether those people could calculate baking cycles. The money spent for labor at Mrs. Fields stores paid for sales skills, not for baking skills. With store controllers at the headquarters offices in Park City, Utah, examining the numbers for each store within twelve hours of the end of each business day, the computer system helped frame an organizational design that gave Mrs. Fields the ability to sell gourmet cookies at a reasonable price.

The point is simple: IS comprise a fundamental organizational component that affects the way managers design their organizations. When used appropriately, IS and information technology (IT) leverage human resources, capital, and materials to create an organization that optimizes performance. A synergy results from designing organizations with IT in mind, which cannot be achieved when IT is just added on.

Chapter 1 introduced a simple framework for understanding the impact of IS on organizations. The Information Systems Strategy Triangle relates business strategy with IS strategy and organizational strategy. In an organization that operates successfully, an overriding business strategy drives both organizational strategy and information strategy. The most effective businesses optimize the interrelationships between the organization and IT, maximizing efficiency and productivity.

Organizational strategy includes the organization's design, as well as the managerial choices that define, set up, coordinate, and control its work processes. As discussed in Chapter 1, many models of organizational strategy are available, such as the business diamond that identifies four primary components of an organization: its business processes, its tasks and structures (or organizational design), its management control systems, and its values and culture. Figure 3.1 summarizes complementary design variables from the managerial levers framework. Optimized organizational design and management control systems support optimal business processes, and they, in turn, reflect the firm's values and culture.

This chapter builds on these models. Of primary concern is the ways in which IT can improve organizational design and management control systems. This chapter considers how IT can best affect organizational and management control variables. It looks at some innovative organizational designs that made extensive use of IT and concludes with some ideas about how organizations of the future will organize with the increasingly widespread use of the Internet and electronic linkages with suppliers, customers, and the world. This chapter focuses on organizational-level issues related to structure. The next two chapters complement it with a discussion of the individual worker and organizational processes.

► INFORMATION AGE ORGANIZATIONS

In 1988, three professors at the Harvard Business School predicted what would be key characteristics for the Information Age organization. Their predictions were close to what actually happened. The following summary of these characteristics

Variable	Description
<i>Organizational variables</i>	
Decision rights	Authority to initiate, approve, implement, and control various types of decisions necessary to plan and run the business.
Business processes	The set of ordered tasks needed to complete key objectives of the business.
Formal reporting relationships	The structure set up to ensure coordination among all units within the organization.
Informal networks	Mechanism, such as ad hoc groups, which work to coordinate and transfer information outside the formal reporting relationships.
<i>Control variables</i>	
Data	The information collected, stored, and used by the organization.
Planning	The processes by which future direction is established, communicated, and implemented.
Performance measurement and evaluation	The set of measures that are used to assess success in the execution of plans and the processes by which such measures are used to improve the quality of work.
Incentives	The monetary and nonmonetary devices used to motivate behavior within an organization.
<i>Cultural variables</i>	
Values	The set of implicit and explicit beliefs that underlie decisions made and actions taken.

FIGURE 3.1 Organizational design variables.

Source: Cash, Eccles, Nohria, and Nolan, *Building the Information Age Organization* (Homewood, IL: Richard D. Irwin, 1994).

relates them to three dimensions: (1) organizational structure, (2) human resources, and (3) management processes.

These characteristics, shown in Figure 3.2, serve as the basis for this and the next two chapters, which describe how information systems affect organizations. Information Age organizations use a different organization structures because they achieve benefits of small and large scale simultaneously, because they have flexible structures, because they blur the lines of controls, and because they focus on projects and processes. Human resources are different because individuals are better trained and therefore are able to work more autonomously. The work environment is increasingly engaging and exciting due to the velocity at which business happens. Finally, Information Age organizations follow management processes designed with information systems in mind. Control is separated from reporting relationships, keeping information flowing throughout the organization. Decision making and creativity are supported by information systems, which retain corporate history, experiences, and expertise in ways non-information-based organizations cannot achieve.

Dimension	Characteristics
Organizational Structure	Companies have benefits of small scale and large scale simultaneously. Large organizations adopt flexible and dynamic structures. The distinctions between centralized and decentralized control blur. Focus is on projects and processes instead of tasks and standard procedures.
Human Resources	Workers are better trained, more autonomous, and more transient. The work environment is exciting and engaging. Management is a shared, rotated, and sometimes part-time job. Job descriptions tied to narrowly defined tasks are non-existent. Compensation is tied directly to contribution.
Management Processes	Decision making is well understood. Control is separated from reporting relationships. Computers support creativity at all levels of the organization. Information systems retain corporate history, experience, and expertise.

FIGURE 3.2 Key characteristics for the Information Age organization.

Source: Applegate, Cash, and Mills, "Information Technology and Tomorrow's Manager," *Harvard Business Review* (November–December 1988), pp. 128–136.

► INFORMATION TECHNOLOGY AND ORGANIZATIONAL DESIGN

This section examines how IT enables or inhibits the design of an organization's physical structure. Ideally an organization is designed to facilitate the communication and work processes necessary for the organization to accomplish its goals. The structure of reporting relationships typically reflects the flow of communication and decision making throughout the organization. Traditional organization structures are hierarchical, flat, or matrix (see Figure 3.3). The networked structure is a newer organizational form. A comparison of these four types of organization structures may be found in Figure 3.4.

Hierarchical Organization Structure

As business organizations entered the twentieth century, they found themselves growing and needing to devise systems for processing and storing information. A new class of worker—the clerical worker—flourished. From 1870 to 1920 alone, the number of clerical workers mushroomed from 74,200 to more than a quarter of a million.¹ Factories and offices structured themselves using the model that Max Weber observed when studying the Catholic Church and the German army. This model, called a bureaucracy, was based on a hierarchical organization structure.

Hierarchical organization structure is an organizational form based on the concepts of division of labor, specialization, and unity of command. When work needs to be done, it typically comes from the top and is segmented into smaller and smaller pieces until it reaches the level of the business in which it will be done. Middle managers do the primary information processing and

¹ Frances Cairncross, *The Company of the Future* (London: Profile Books, 2002).

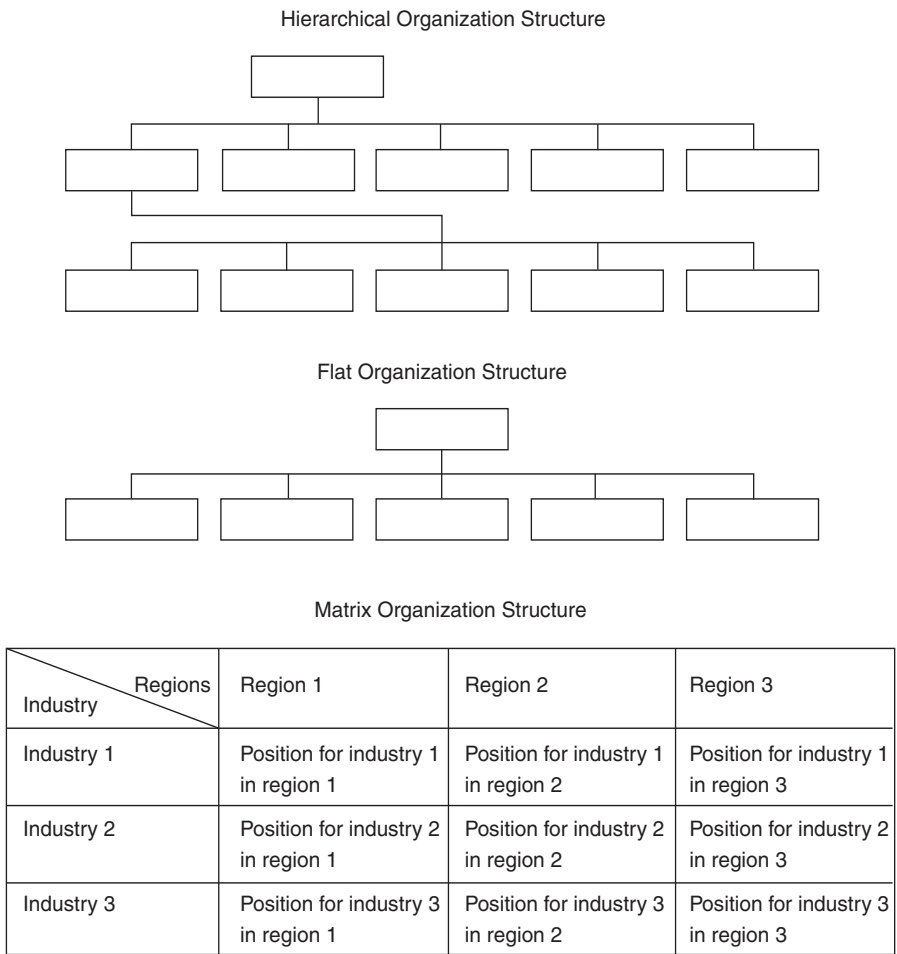


FIGURE 3.3 Hierarchical, flat, and matrix organization structures.

communication function, telling their subordinates what to do and telling senior managers the outcome of what was done. Jobs within the organization are specialized and often organized around particular functions, such as marketing, accounting, manufacturing, and so on. Unity of command means that each person has a single supervisor, who in turn has a supervisor, and so on. A number of rules are established to handle the routine work performed by employees of the organization. When in doubt about how to complete a task, workers turn to rules. If a rule doesn't exist to handle the situation, workers turn to the hierarchy for the decision. Key decisions are made at the top and filter down through the organization in a centralized fashion. IS are typically used to store and communicate information along the lines of the hierarchy and to support the information management function of the managers. Hierarchical structures are most suited to

	Hierarchical	Flat	Matrix	Networked
Description	Bureaucratic form with defined levels of management	Decision making pushed down to the lowest level in the organization	Workers assigned to two or more supervisors in an effort to make sure multiple dimensions of the business are integrated	Formal and informal communication networks that connect all parts of the company
Characteristics	Division of labor, specialization, unity of command, formalization	Informal roles, planning and control; often small and young organizations	Dual reporting relationships based on function and purpose	Known for flexibility and adaptability
Type of Environment Best Supported	Stable Certain	Dynamic Uncertain	Dynamic Uncertain	Dynamic Uncertain
Basis of Structuring	Primarily function	Primarily function	Functions and purpose (i.e., location, product, customer)	Networks
Power Structure	Centralized	Centralized	Distributed (matrix managers)	Distributed (network)
Key Technologies Supporting This Structure	Mainframe, centralized data and processing	Personal computers	Networks	Intranets and Internet

FIGURE 3.4 Comparison of organizational structures.

relatively stable, certain environments where the top-level executives are in command of the information needed to make critical decisions.

Flat Organization Structure

In contrast, in the **flat organization structure**, decision making is centralized, with the power often residing in the owner or founder. In flat organizations, everyone does whatever needs to be done in order to complete business. For this reason, flat organizations can respond quickly to dynamic, uncertain environments. Entrepreneurial organizations often use this structure because they

typically have fewer employees, and even when they grow they initially build on the premise that everyone must do whatever is needed. As the work grows, new individuals are added to the organization, and eventually a hierarchy is formed where divisions are responsible for segments of the work processes. Many companies strive to keep the “entrepreneurial spirit,” but in reality work gets done in much the same way as with the hierarchy described previously. Flat organizations often use IS to off-load certain routine work in order to avoid hiring additional workers. As a hierarchy develops, the IS become the glue tying together parts of the organization that otherwise would not communicate.

Matrix Organization Structure

The third popular form, the **matrix organization structure**, typically assigns workers to two or more supervisors in an effort to make sure multiple dimensions of the business are integrated. Each supervisor directs a different aspect of the employee’s work. For example, a member of a matrix team from marketing would have a supervisor for marketing decisions and a different supervisor for a specific product line. The team member would report to both, and both would be responsible in some measure for that member’s performance. In some cases the matrix reflects a third dimension (or more), such as the customer relations segment. IS reduce the operating complexity of matrix organizations by allowing information sharing among the different managerial functions. For example, a salesperson’s sales would be entered into the information system and appear in the results of all of the managers to whom he or she reports. The matrix structure allows organizations to concentrate on both functions and purpose. It is especially suited to dynamic, uncertain environments.

Matrix organizations often fail to enable managers to achieve their business strategies, however. Applegate, McFarlan, and McKenney describe the problem as follows:

The inability to cope with the increased information processing demands was a major cause of the failure of the matrix organization. In the 1960s, mainframe system architectures, with their centralized control of information processing, mirrored the centralized intelligence and control of the hierarchy. The microcomputer revolution of the 1980s provided tools to decentralize information processing control that mirrored organizational attempts to decentralize decision authority and responsibility to small entrepreneurial units. While these decentralized IT resources helped improve local decision making, the debates and conflicts concerning whether to centralize or decentralize IT resource management reflected organizational arguments concerning the centralization or decentralization of organizational decision authority. However, the network revolution of the 1990s enables distributed information processing and intelligence that make the IT centralization/decentralization debates of the 1980s irrelevant.²

² L. M. Applegate, W. McFarlan, and J. McKenney, *Corporate Information Systems Management: Text and Cases*, 4th ed. (Boston: Richard D. Irwin, Inc., 1996).

Networked Organization Structure

Made possible by new IS, a fourth type of organizational structure emerged: the **networked organization structure** (see Figure 3.5). Networked organizations characteristically feel flat and hierarchical at the same time. An article published in the *Harvard Business Review* describes this type of organization: “Rigid hierarchies are replaced by formal and informal communication networks that connect all parts of the company. . . . [This type of organizational structure] is well known for its flexibility and adaptiveness.”³ It is particularly suited to dynamic, unstable environments.

Networked organization structures are those that utilize distributed information and communication systems to replace inflexible hierarchical controls with controls based in IS. Networked organizations are defined by their ability to promote creativity and flexibility while maintaining operational process control. Because networked structures are distributed, many employees throughout the organization can share their knowledge and experience, and participate in making key organizational decisions. IS are fundamental to process design; they improve process efficiency, effectiveness, and flexibility. As part of the execution of these processes, data are gathered and stored in centralized data warehouses for use in analysis and decision making. In theory at least, decision making is more timely and accurate because data are collected and stored instantly. The extensive use of communications technologies and networks also renders it easier to coordinate across functional

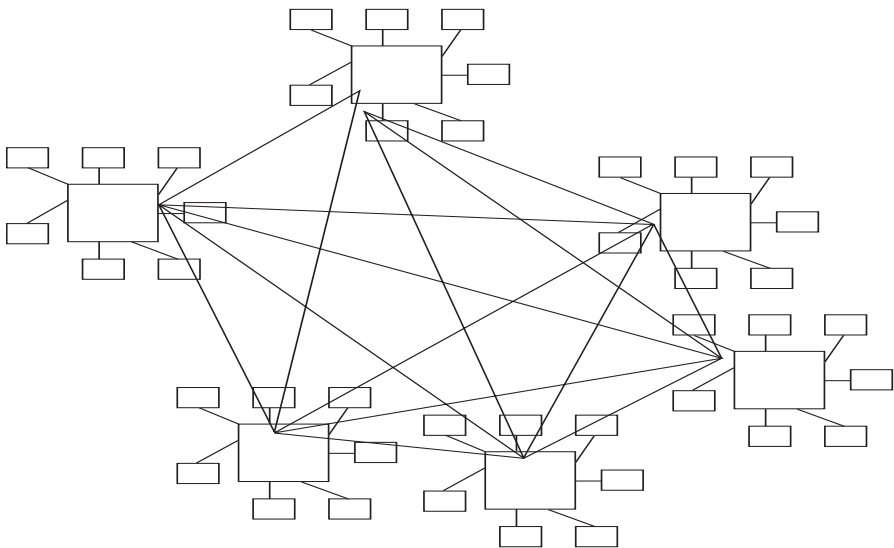


FIGURE 3.5 The networked organization.

³ L. M. Applegate, J. I. Cash, and D. Q. Mills, “Information Technology and Tomorrow’s Manager,” *Harvard Business Review* (November–December 1988), pp. 128–136.

boundaries. In short, the networked organization is one in which IT ties together people, processes, and units.

The organization feels flat when IT is used primarily as a communication vehicle. Traditional hierarchical lines of authority are used for tasks other than communication when everyone can communicate with everyone else, at least in theory. The term used is *technological leveling*, because the technology enables individuals from all parts of the organization to reach all other parts of the organization.

Some organizations take the networked structure one step further. When IT is used extensively as a design tool for the organization, a different organizational form called the T-form organization is possible. The “T” stands for “technology-based” or “technology-oriented.” In T-form organizations, IT is combined with traditional organizational components to form new types of components, such as electronic linking, production automation, electronic workflows, electronic customer/supplier relationships, and self-service Internet portals. While the original T-form organization was created long before the Internet was popular, this structure has been adopted by many Internet-based companies today.

Work is often coordinated automatically in the T-form organization. Systems enable information to more easily move around an organization and among individuals, making decisions possible wherever they are needed, rather than only at senior levels of the organization. Business processes are typically designed differently, relying on the technology for more mundane, repetitive tasks, and enabling employees to take on more people-oriented and unstructured responsibilities. These types of organizations are increasingly broadening their electronic network to include suppliers and customers. For example, Procter & Gamble works closely with Wal-Mart to make sure shelves are stocked and inventories replenished automatically. Technology is integrated with all components of the business, not just communications networks, as in a traditional networked organization.

► INFORMATION TECHNOLOGY AND MANAGEMENT CONTROL SYSTEMS

Not only does IT change the way organizations are structured, it also profoundly affects the way managers control their organizations. By control, we mean how people and processes are monitored, evaluated, given feedback, and compensated or rewarded. Figure 3.6 summarizes the activities of management control.

Traditional hierarchical organizations require managers to tightly control operating processes. To do so, they must understand the standard operating procedures for the primary activities of the organization.⁴ The complexity of the activities is handled by creating divisions and subdivisions and dividing the work among them. The subdivision continues until individual jobs are specified and tasks are assigned to individual workers. Then begins the work of the control systems: to ensure that the work is done on time, properly, and within budget.

⁴ Robert Simons, *Levers of Control: How Managers Use Innovative Control Systems to Drive Strategic Renewal* (Boston: Harvard Business School Press, 1995).

Control Activities	Brief Definition
Monitoring	Observing and keeping track of the progress, quality, cost, time, and other relevant parameters.
Evaluating	Comparing the data collected through monitoring to standards or historical data.
Providing Feedback	Communicating the results of evaluation to the individuals responsible for the activities and tasks.
Compensating	Deciding on salary or other forms of payment to those individuals who performed the tasks.
Rewarding	Deciding and delivering bonuses, recognition, or other types of prize for exemplary work.

FIGURE 3.6 Model of management control activities.

IS play three important roles in management control processes:

1. *Collection*: They enable the collection of information that may not be collectible other ways.
2. *Communication*: They speed the flow of information from where it is generated to where it is needed.
3. *Evaluation*: They facilitate the analysis of information in ways that may not be possible otherwise.

These roles played by IS are subsumed in various management control activities that we outline in Figure 3.6 and discuss next.

Information Technology Changes the Way Managers Monitor

Monitoring work can take on a completely new meaning with the use of information technologies. IS make it possible to collect such data as the number of key-strokes, the precise time spent on a task, exactly who was contacted, and the specific data that passed through the process. For example, a call center that handles customer service telephone calls is typically monitored by an information system that collects data on the number of calls each representative received and the length of time each representative took to answer each call and then to respond to the question or request for service. Managers at call centers can easily and nonintrusively collect data on virtually any part of the process. In contrast, a manager of field representatives might also use IS to monitor work, but the use may be more obvious and thus present an intrusion. For example, having field sales personnel complete documents detailing their progress adds work for them.

The organizational design challenge is twofold: (1) to embed monitoring tasks within everyday work, and (2) to reduce the negative impacts to workers being monitored. Workers perceive their regular tasks as value-adding, but have difficulty in seeing how value is added by tasks designed to provide information for management control. Often these tasks are avoided, or worse, data recorded are

inaccurate, falsified, or untimely. Collecting monitoring data directly from work tasks—or embedding the creation and storage of performance information into software used to perform work—renders them more reliable.

Employee monitoring systems may be intrusive and can hurt morale. Employees should receive prior notice that they are being monitored, but this awareness often heightens their stress levels. Also, tracking job performance in terms of discrete, measurable tasks can serve to disconnect the worker from the larger business process in which he or she is involved, giving him or her less opportunity to broaden his or her skills and advance in the organization. Breaking down jobs into simple tasks counters an organizational philosophy that seeks to empower individuals to make significant contributions to the company as a whole.

Information Technology Changes the Way Managers Evaluate

IS make it possible to evaluate data against reams of standard or historical data as desired. Models can be built and simulations designed. Thus, managers can more easily and completely understand the progress and performance of work. In fact, the ready availability of so much information catches some managers in “analysis paralysis:” analyzing too much or too long. In our example of the call center, a manager can compare a worker’s output to that of colleagues, to earlier output, to historical outputs reflecting similar work conditions at other times, and so on.

Even though evaluation constitutes an important use of IS, how the information is used has significant organizational consequences. Information collected for evaluation may be used to provide feedback so the worker can improve personal performance; it also can be used to determine rewards and compensation. The former use—for improvement in performance—is nonthreatening and generally welcome. Using the same information for determining compensation or rewards, however, can be threatening. Suppose the call center manager is evaluating the number and duration of calls service representatives answer on a given day. The manager’s goal is to make sure all calls are answered quickly, and he or she communicates that goal to his or her staff. Now think about how the evaluation information is used. If the manager simply provides the workers with information about numbers and duration, then the evaluation is not threatening. Typically, each worker will make his or her own evaluation and respond by improving call numbers and duration. A discussion may even occur in which the service representative describes other important dimensions, such as customer satisfaction and quality. Perhaps the representative takes longer than average on each call because of the attention devoted to the customer. On the other hand, if the manager uses the information about number of calls and duration to rank workers so that top workers are rewarded, then workers may feel threatened by the evaluation and respond accordingly. The representative not on the top of the list may shorten calls, deliver less quality, or cause a decrease in customer satisfaction. The lesson for managers is to take care concerning what is monitored and how the information the systems make available is used. Metrics for performance must be meaningful in terms of the organization’s broader goals, but these metrics are harder to define when work is decentralized and monitored electronically.

Information Technology Changes the Way Managers Provide Feedback

Using evaluation information for rewards will drive organizational behavior. How feedback is communicated in the organization also plays a role in affecting behavior.

Some feedback can be communicated via IS themselves. A simple example is the feedback built into an electronic form that will not allow it to be submitted until it is properly filled out. For more complex feedback, IS may not be the appropriate vehicle. For example, no one would want to be told they were doing a poor job via e-mail or voice mail. Negative feedback of significant consequence often is best delivered in person or over the telephone in real time.

IS can allow for feedback from a variety of participants who otherwise could not be involved. Many companies do a “360-degree” feedback, into which the individual’s supervisors, subordinates, and coworkers all provide input. IS make it relatively easy to solicit feedback from anyone who has access to the system. Because that feedback is received more quickly, improvements can be made faster.

Information Technology Changes the Way Managers Compensate and Reward

Compensation and rewards are the ways organizations create incentives to good performance. A clever reward system can make employees feel good without paying them more money. IS can affect these processes, too. Some organizations use their Web sites to recognize high performers. Others reward them with new technology. At one organization, top performers get new computers every year, while lower performers get the “hand-me-downs.”

IS make it easier to design complex incentive systems, such as shared or team-based incentives. An information system facilitates keeping track of contributions of team members and, in conjunction with qualitative inputs, can be used to allocate rewards according to complex formulas. For example, in the call center example, tracking metrics, such as “average time per call” and “number of calls answered,” allows the manager to monitor agents’ performance. This quantitative data makes for useful comparisons, but it cannot account for qualitative variables: for example, agents who spend more time handling calls may be providing better customer service. Agents who know they will be evaluated by the volume of calls they process may rush callers and provide poorer service in order to maximize their performance according to the narrow metric. Agents providing the poorest service could in fact be compensated best if the firm’s performance evaluation and compensation strategy is linked only to such metrics. The manager must consider both the metrics and qualitative data in assigning compensation and rewards.

Information Technology Changes the Way Managers Control Processes

The preceding section primarily addresses the control of individuals. Managers also need to control work done at the process level. At the individual level, IS can streamline the process of monitoring, evaluating, and compensating. Process control is a different matter.

Process control refers to the levers available to a manager to ensure that operational processes are carried out appropriately. A percentage of that control lies in

making sure individuals perform appropriately. The process itself needs continuous improvement, and although the various methods of process improvement lie outside the scope of this book, it is important to understand that IS can play a crucial role. IS provide decision models for scenario planning and evaluation. For example, the airlines routinely use decision models to study the effects of changing routes or schedules. IS collect and analyze information from automated processes, and they can be used to make automatic adjustments to the processes. For example, a paper mill uses IS to monitor the mixing of ingredients in a batch of paper and to add more ingredients or change the temperature of the boiler as necessary. IS collect, evaluate, and communicate information, leaving managers free to make decisions.

► VIRTUAL ORGANIZATIONS

The virtual organization provides a clear example of how organizations can be designed differently using information. A **virtual organization** is a structure that makes it possible for individuals to work for an organization and live anywhere. The Internet and corporate intranets create the opportunity for individuals to work from anywhere they can access a computer—from home, satellite offices, customer sites, and hotel rooms.

The structure of a virtual organization is networked. Everyone has access to everyone else using technology. Hierarchy may be present in the supervisory roles, but work is done crossing boundaries. For work that can be done on a computer or work that makes extensive use of telecommunications, technologies such as ISDN, the Internet, and Microsoft Outlook make it possible to design a work environment anywhere. E-mail is the most widely used means of communication, making it possible for even the newest member of a team to communicate with the most senior person in the organization. The basis of success in a virtual organization is the amount of collaboration that takes place between individuals. In a traditional organization, individuals mainly collaborate by holding face-to-face meetings. They use IS to communicate and to supplement these meetings, but the culture requires “looking at eyeballs” to get work done. By contrast, a virtual organization uses its IS as the basis for collaboration. For example, Diamond Technology Partners, the consulting firm discussed earlier, uses Lotus Notes as the basis for collaborative work, thus giving its consultants access to the entire knowledge of the organization from the “portal” of its computers.

In the virtual organization, processes are designed differently, reflecting the fact that not everyone will be in the office to do the tasks in the process. For example, when management wants to reward an employee, assigning that person a larger or more prestigious office is not a useful reward. A different reward system is needed. Supervisory processes differ as the responsibility shifts from the manager keeping tabs on the employee, to the employee keeping the manager informed of progress, problems, and needed assistance. Support processes also change. Paper-

based forms that get filed into a single cabinet need to be replaced by electronic forms that can circulate and are accessible everywhere. Business processes must accommodate the new organization. One insurance company put its customer service and order processing systems online so that teleworkers can take calls and complete the processes from anywhere.

VeriFone, a leading manufacturer of credit verification systems, is well known for its virtual organization.⁵ The company was founded in 1981 by an entrepreneur who hated bureaucracy. By 1990, it was the leading company for transaction automation with products and services used in more than 80 countries. VeriFone's office building in northern California houses a nominal corporate headquarters. In several plants around the world, its processing systems are actually made, and its distribution centers facilitate rapid delivery to customers. Most corporate functions, however, occur at multiple global locations, including Texas, Hawaii, India, and Taiwan. The company seeks to put its people in close proximity to customers and emerging markets, which results in about a third of the employees traveling roughly half of the time. This strategy gives VeriFone first-hand information about business opportunities and competitive situations worldwide.

At the heart of the company culture is constant and reliable sharing of information. It is a culture that thrives on the chief executive officer's ban on secretaries and paper correspondence. Everyday the chief information officer (CIO) gathers yesterday's results and measures them against the company's plans. Systems post travel itineraries of everyone in the company and track which people speak what languages. Using IS for simulation and analysis, the CIO pulls together information from databases around the company for an e-mail newsletter to everyone in the company. The newsletter describes the latest products, competitive wins, and operating efficiencies. The top 15 salespeople are often listed, along with their sales figures. More than just managing the IS, VeriFone's CIO provides the "information glue" that holds the virtual organization together.

A story is told of a new salesperson who was trying to close a particularly big deal. He was about to get a customer signature on the contract when he was asked about the competition's system. Being new to the company, he did not have an answer, but he knew he could count on the company's information network for help. He asked his customer for 24 hours to research the answer. He then sent a note to everyone in the company asking the questions posed by the customer. The next morning, he had several responses from others around the company. He went to his client with the answers and closed the deal.

What is interesting about this example is that the "new guy" was treated as a colleague by others around the world, even though they did not know him personally. He was also able to collaborate with them instantaneously. It was standard

⁵ Hossam Galal, Donna Stoddard, Richard Nolan, and Jon Kao, "VeriFone: The Transaction Automation Company," Harvard Business School case study 195-088.

procedure, not panic time, because of the culture of collaboration in this virtual organization. The information infrastructure provided the means, but the organization built on top of it consisted of processes designed for individuals at a geographical remove.

► VIRTUAL TEAMS

Few organizations are as totally virtual as Verifone. However, an increasing number of organizations have virtual components called virtual teams. **Virtual teams** are defined as “geographically and/or organizationally dispersed coworkers that are assembled using a combination of telecommunications and information technologies to accomplish an organizational task.”⁶ This definition includes teams whose members seldom meet face-to-face. The members of virtual teams may be in different locations, organizations, time zones, or time shifts. Further, virtual teams may have distinct, relatively permanent membership, or they may be relatively fluid as they evolve to respond to changing task requirements and as members leave and are replaced by new members.

Several reasons explain the growing popularity of virtual teams:

- As information needs mushroom, organizations rely increasingly upon the skills as knowledge of individuals dispersed across different countries, time zones, and organizations.
- The enhanced bandwidths of today’s telecommunication technologies promote the use of networks linking individuals, internal and external to the organization.
- Technology in the form of group support systems, groupware, and decision-making support software is available to assist virtual teams in collaborating and making decisions.
- Difficulties in getting relevant stakeholders together physically are relaxed.
- Growing pressure for offshoring has resulted in systems development by global virtual teams whose members are located around the world.

Virtual teams clearly offer advantages in terms of expanding the knowledge base through team membership, increasing representation in ad hoc teams, and *following the sun*. In an example of following the sun, London team members of a virtual team of software developers at Tandem Services Corporation initially code the project and transmit their code each evening to U.S. team members for testing. U.S. members forward the code they tested to Tokyo for debugging. London

⁶ A. M. Townsend, S. DeMarie, and A.R. Hendrickson, “Virtual Teams: Technology and the workplace of the future,” *Academy of Management Executive*, 12, 3 (1998), pp. 17–28.

team members start their next day with the code debugged by their Japanese colleagues, and another cycle is initiated.⁷ However, time zones can work against virtual team members when they are forced to stay up late or work in the middle of the night in order to communicate with team members in other time zone. A summary of this and other challenges in comparison with more traditional teams can be found in Figure 3.7.

A major communication challenge that virtual teams face stems from their only being able to communicate electronically via e-mail, teleconferences, or messaging systems. Electronic media allow team members to transcend the limitations of space, and even store messages for future references. But, electronic communications may not allow team members to convey the nuances that are possible with face-to-face conversations. In addition, virtual teams differ from traditional teams in terms of technological and diversity challenges. For example, traditional teams, unlike virtual ones, may not have to deal with the hassles of learning new technologies or selecting the technology that is most appropriate for the task at hand. Perhaps the greatest challenges that virtual teams face in comparison to their more traditional counterparts arise from the diversity of the team members. Virtual teams enable members to come from many different cultures and nations. Even though this diversity allows managers to pick team members from a wider selection of experts, global virtual teams are more likely than more traditional teams to be stymied by team members who have different native languages.

Managers cannot manage virtual teams in the same way that they manage more traditional teams. The differences in management control activities are particularly pronounced. Leaders of virtual teams cannot easily observe the behavior of virtual team members. Thus, monitoring of behavior is likely to be more limited than in traditional teams. Performance is more likely to be evaluated in terms of output than on displays of behavior. Because the team members are dispersed, providing feedback is especially important—not just at the end of a team's project, but throughout the team's life. In order to encourage the accomplishment of the team's goal, compensation should be based heavily on the team's performance, rather than just on individual performance. Compensating team members for individual performance may result in "hot-rodding" or lack of cooperation among team members. Organizational reward systems must be aligned with the accomplishment of desired team goals. This alignment is especially difficult when virtual team members belong to different organizations, each with their own unique reward and compensation systems. Each compensation system may affect individual performance in a different way. Managers need to be aware of differences and attempt to discover ways to provide motivating rewards to all team members.

⁷ Marie-Claude Boudreau, Karen Loch, Daniel Robey, and Detmar Straub, "Going global: Using information technology to advance the competitiveness of the virtual transnational organization," *Academy of Management Executive*, 12, 4 (1998), pp. 120–128.

Challenges	Virtual Teams	Traditional Teams
Communication	• Multiple time zones can lead to greater efficiencies when leveraged, but can also create communication difficulties in terms of scheduling meetings and interactions. • Communication dynamics such as facial expressions, vocal inflections, verbal cues, and gestures are altered.	• Teams are collocated in same time zone. Scheduling is less difficult. • Teams may use richer communication media, including face-to-face discussions.
Technology	• Team members must have proficiency across a wide range of technologies; VT membership may be biased toward individuals skilled at learning new technologies. • Technology offers an electronic repository that may facilitate building an organizational memory. • Work group effectiveness may be more dependent on the ability to align group structure and technology with the task environment.	• Technology is not critical for group processes. Technological collaboration tools, while possibly used, are not essential for communications. Team members may not need to possess these skills. • Electronic repositories are not typically used. • Task technology fit may not be as critical.
Team Diversity	• Members typically come from different organizations and/or cultures. This makes it: • Harder to establish a group identity • Necessary to have better communication skills • More difficult to build trust, norms, and shared meanings about roles, because team members have fewer cues about their teammates' performance • More likely that they have different perceptions about time and deadlines	• Because members are more homogeneous, group identity is easier to form. • Because of commonalities, communications are easier to complete successfully.

FIGURE 3.7 Comparison of challenges facing virtual teams and traditional teams.

Looking beyond these management control activities, we see that prescriptions for managing the communications and information technologies in virtual team environments are limited. Since the distances are often great, managers clearly need to keep the channels of communication open to allow team members to get their

work done. Some tasks lend themselves to certain technologies. This means that they must have the necessary technological support. For instance, if a manager wants to have a meeting of team members but has neither the budget nor the lead time to plan for extensive travel to the meeting, video conferencing may be a viable alternative. E-mails are excellent for short messages to one or all group members. Managers may decide to initiate a team's activity with a face-to-face meeting so that the seeds of trust can be planted and team members feel as if they know one another on a more personal basis. Face-to-face meetings also appear to be the heartbeat of successful global virtual teams.⁸ Successful virtual teams organize their activities around regularly-scheduled face-to-face meetings. Before each meeting there is a flurry of communication and activity as team members prepare for the meeting. After the meeting there are considerable follow-up messages and tasks. Managers may also seek to provide technologies to support individual team member characteristics. For team members who are conscious of deadlines, planning and scheduling software may be especially useful. Team members who are polychronous and prefer to do several activities at one time may want to have instant messaging or Skype (a Voice-over-IP support system) available to them so that they can communicate with their teammates and still work on other tasks. (Instant messaging and Voice-over-IP are discussed in more detail in Chapter 7.)

Having the needed communication and information technologies available means that all team members have the same or compatible technologies at their locations. The support staff to maintain and update the systems must be in place. Further, managers must also provide the framework for using the technology. Policies and norms, or unwritten rules, need to be established about how the team members should use the technology to work with one another.⁹ These should include norms about telephone, e-mail, and videoconferencing etiquette (i.e., how often to check for messages, the maximum time to wait to return e-mails, warning team members about absences or national holidays, etc.), work to be performed, and so on. Such norms are especially important when team members are not in the same office and cannot see when team members are unavailable.

► FOOD FOR THOUGHT: IMMEDIATELY RESPONSIVE ORGANIZATIONS

A series of ideas are floating around centered on the immediacy of responses that IS make possible and the organizational forms that result (see, for example, the

⁸ M.L. Maznevski, K. Chudoba, "Bridging space over time: Global virtual team dynamics and effectiveness," *Organization Science*, 2000, (11:5), 373–392.

⁹ C. Saunders, C. Van Slyke, and D.R. Voge, "My time or yours? Managing time visions in global virtual teams," *Academy of Management Executive*, (18:1) 2004, 19–31.

popular books *Blur*,¹⁰ *Real Time*,¹¹ *Corporate Kinetics*,¹² *Adaptive Enterprise*,¹³ and *The Horizontal Organization*.¹⁴ These ideas suggest that the increased use of IS in general, and the Internet in particular, make possible the ability to respond instantly to customer demands, supplier issues, and internal communication needs. IS are enabling even more advanced organization forms such as the adaptive organization, the horizontal organization, and a relatively new form, the zero time organization.¹⁵ Common to all of these designs is the idea of agile, responsive organizations that can configure their resources and people quickly and are flexible enough to sense and respond to changing demands.

The zero time organization, for example, describes the concept of instant “customerization,” or the ability to respond to customers immediately. In order to accomplish this goal, the organization must master five disciplines:

1. *Instant value alignment*: understanding the customer so well that the company anticipates and is therefore ready to provide exactly what the customer wants.
2. *Instant learning*: building learning directly into the company’s tasks and processes and making sure that requisite information is readily at hand when it is needed.
3. *Instant involvement*: using IS to communicate all relevant information to suppliers, customers, and employees and making sure everyone is prepared to deliver their products, services, or information instantly.
4. *Instant adaptation*: creating a culture and structure that enable all workers to act instantly and to make decisions to respond to customers.
5. *Instant execution*: building business processes that involve as few people as possible (no touch), electronically cross organizational boundaries, and result in cycle times so short that they appear to execute instantly when the customer needs their outputs.

Building in the capability to respond instantly means designing the organization so that each of the key structural elements is able to respond instantly. For example, instant learning means building learning into the business processes. It means using IS to deliver small modules of learning directly to the point where the

¹⁰ Stan Davis, and Christopher Meyer, *Blur* (Reading, MA: Perseus Books, 1998).

¹¹ Regis McKenna, *Real Time* (Boston: Harvard Business School Press, 1997).

¹² Michael Fradette and Steve Michaud, *Corporate Kinetics* (New York: Simon and Schuster, 1998).

¹³ Stephan H. Haeckel and Adrian J. Slywotzky, *Adaptive Enterprise: Creating and Leading Sense-and-Respond Organizations* (Boston: Harvard Business School Press, 1999).

¹⁴ Frank Ostroff, *The Horizontal Organization: What the Organization of the Future Actually Looks Like and How It Delivers Value to Customers* (New York: Oxford University Press, 1999).

¹⁵ R. Yeh, K. Pearson, and G. Kozmetsky, *ZeroTime: Providing Instant Customer Value Everytime-All the Time* (New York: Wiley, 2000).

process is being done. For example, at Dell Computers, assembly line workers have access to a terminal directly above their workstations. As an assembly comes to their stations, its bar code tells the information system what type of assembly it is and which instructions to display. When the assembly reaches the table, the instructions are already there. The worker does not have to ask for the instructions, nor go anywhere to find them. IS allows this instant learning to happen.

Few companies qualify as zero time organizations. As IS become ubiquitous and customers increasingly demand instant service, zero time characteristics will become even more common in business.

► SUMMARY

- Incorporating information systems as a fundamental organizational design component is critical to company survival. Organizational strategy includes the organization's design, as well as the manager's choices that define, set up, coordinate, and control its work processes.
- Organizational designers today must have a working knowledge of what information systems can do and how the choice of information system will affect the organization itself.
- Information flows can facilitate or inhibit organizational structures.
- Forms such as flat, hierarchical, and matrix organizations are being enhanced by information technology resulting in networked organizations and virtual organizations that can better respond to dynamic, uncertain organizational environments.
- Information technology affects managerial control mechanisms: monitoring, evaluating, providing feedback, compensating, and rewarding. It is the job of the manager to ensure the proper control mechanisms are in place and the interactions between the organization and the information systems do not undermine the managerial objectives.
- A virtual organization is a structure that makes it possible for individuals to work for an organization and live anywhere. They are made possible through information and communication technologies.
- Virtual teams are defined as "geographically and/or organizationally dispersed coworkers that are assembled using a combination of telecommunications and information technologies to accomplish an organizational task." They are an increasingly common organizational phenomenon and must be managed differently from more traditional teams, especially when team members are from different organizations, cultures, or countries.

► KEY TERMS

flat organization
structure (p. 00)

hierarchical organization
structure (p. 00)

networked organization
structure (p. 00)

matrix organization
structure (p. 00)

organizational strategy
(p. 00)

virtual organization (p. 00)
virtual team (p. 00)

► DISCUSSION QUESTIONS

1. How might IT change a manager's job?
2. Is monitoring an employee's work on a computer a desirable or undesirable activity from a manager's perspective? From the employee's perspective? Defend your position.
3. E-mail makes communications between individuals much easier. Give an example of a type of communication that would be inappropriate if it only took place over e-mail. What is an example of an appropriate communication for e-mail?
4. It is sometimes argued that team members must meet face-to-face in order to accomplish more complex, meaningful tasks? Do you agree? Explain.
5. Consider the brief description of the zero time organization. What is an example of a control system that would be critical to manage for success in the zero time organization? Why?
6. Mary Kay, Inc., sells facial skin care products and cosmetics around the globe. The business model is to provide one-on-one, highly personalized service. More than 500,000 Independent Beauty Consultants (IBCs) sell in 29 markets worldwide. Each IBC runs his or her own business by developing a client base, and then providing services and products for sale to those clients. Recently the IBCs were offered support through an e-commerce system with two major components: mymk.com and Mary Kay InTouch. Mymk.com allows IBCs to create instant online sites where customers can shop anytime directly with their personal IBC. Mary Kay InTouch streamlines the ordering process by automatically calculating discounts, detecting promotion eligibility, allowing the IBCs to access up-to-date product catalogs, and providing a faster way to transact business with the company.¹⁶
 - a. How would the organizational strategy need to change to respond to Mary Kay's new business strategy?
 - b. What changes would you suggest Mary Kay, Inc. managers make in their management systems order to realize the intended benefits of the new systems? Specifically, what types of changes would you expect to make in the evaluation systems, the reward systems, and feedback systems?

CASE STUDY 3-1**VIRTUALLY THERE?**

Dr. Laura Esserman leans forward and speaks with conviction, making broad gestures with her hands. "Over the past couple of decades, I've watched industries be transformed by the use of information systems and incredible visual displays," she says. "What we could do is to completely change the way we work—just by changing the way we collect and share information."

Sounds familiar, right? But Esserman isn't championing yet another overzealous Silicon Valley start-up—she's envisioning how cancer patients will interact with their doctors. If

¹⁶ Adapted from "Mary Kay, Inc.," *Fortune*, Microsoft supplement (November 8, 1999), p. 5.

Esserman, a Stanford-trained surgeon and MBA, has her way, patients won't sit passively on an exam table, listening to impenetrable diagnoses and memorizing treatment instructions. Instead, they'll have access to a multimedia treasure chest of real-time diagnosis, treatment, and success-rate data from thousands of cases like their own. Better still, they won't meet with just one doctor. There will be other doctors on the case—some from the other side of the hospital and some, perhaps, from the other side of the world.

Esserman and her colleagues at the University of California San Francisco's Carol Franc Buck Breast Care Center are pioneers in the new world of virtual teams and virtual tools, a world in which there will be real change in the way highly trained people whose work depends on intense collaboration get things done. Her goal at the Buck Breast Care Center is to use virtual tools to bring more useful information (and more doctors) into the exam room. Why? Because two heads really are better than one. She explains that when patients see their doctors after a breast cancer diagnosis, for example, they are handed a recommended course of treatment that involves serious choices and trade-offs. Of course, most patients don't know enough about the merits of, say, a lumpectomy versus a mastectomy to make an informed choice, so they trust their doctors to tell them what to do.

But a single doctor isn't always equipped to make the best decision, especially since different procedures can have very different long-term physical and emotional impacts—but may not be all that different in their short-term medical outcomes. "Very often," Esserman says, "doctors recommend a particular treatment because they're more familiar with it. But we should be advocates for our patients, rather than our specialties."

Although her full-blown program is a long way off, Esserman has run a pilot project with 24 patients. She worked with both Oracle, the Silicon Valley database giant, and MAYA Viz, a Pittsburgh company that develops "decision community" software, to allow doctors across the country to collaborate virtually. Through Esserman's approach, when a patient arrives at the doctor's office to receive treatment instructions, instead of listening to a physician's monologue, she's handed a printout. On the top left side of the page is the diagnosis, followed by patient-specific data: the size and spread of the tumor, when it was discovered, and the name of the treating doctor. Below that is statistical information generated from clinical-research databases, such as the number of similar cases treated each year and details about survival rates.

A set of arrows point to treatment options. Next, the patient reads the risks and benefits associated with each treatment. She can follow along as the doctor explains the chances that the cancer will recur after each option and the likelihood that a particular treatment will require follow-up procedures, as well as a comparison of survival rates for each one.

At this point, the patient has an opportunity to voice concerns about treatment options, and the physician can explain her experiences with each one. "When you share this kind of information, patients and doctors can make decisions together according to the patient's values," Esserman says. This is where the network tools come into play. Drawing from stored databases of both clinical trials and patient-treatment histories local to the hospital, the physician can compare courses of action and results far beyond her own personal experience. "A medical opinion is really just one physician's synthesis of the information," notes Esserman. "So you need a way to calibrate yourself—a way to continually ask, Are there variations among the group of doctors that I work with? Am I subjecting people to procedures that turn out not to be useful?"

With a real-time, shared-data network, these questions can be answered at the touch of a button instead of after hours, weeks, or months of research. But that's just the beginning. A real-time network also presents the possibility of seeking help from other specialists on puzzling cases, even if those specialists are on the other side of the world.

Discussion Questions

1. Why does this case offer an example of a virtual team? In what ways are the team members on this team dispersed (i.e., location, organization, culture, etc.)?
2. What are the advantages of the virtual team described in this case?
3. What technological support is needed for the virtual team to meet its goals?
4. What suggestions can you offer Dr. Esserman for managing this virtual team?

Source: Excerpted from Alison Overholt, "Virtually There" *FastCompany*, 56 (March 2002), p. 108, available at <http://www.fastcompany.com/online/56/virtual.html>.

CASE STUDY 3-2**THE FBI?**

The Federal Bureau of Investigation of the U.S. government, the FBI, was forced to scrap its \$170 million virtual case file (VCF) management system. Official reports blamed numerous delays, cost overruns, and incompatible software. But a deeper examination of the cause of this failure uncovered issues of control, culture, and incompatible organizational systems.

Among its many duties, the FBI is charged with the responsibility to fight crime and terrorism. To do so requires a large number of agents located within the United States and around the world. That means agents must be able to share information among themselves within the bureau, and with other federal, state, and local law enforcement agencies. But sharing information has never been standard operating procedure for this agency. According to one source, "agents are accustomed to holding information close to their bulletproof vests and scorn the idea of sharing information."

Enter the FBI's efforts to modernize its infrastructure, codenamed "Trilogy." The efforts included providing agents with 30,000 desktop PCs, high-bandwidth networks to connect FBI locations around the world, and the VCF project to facilitate sharing of case information worldwide. The FBI Director explained to Congress that VCF would provide "an electronic means for agents to globally send field notes, documents, pieces of intelligence and other evidence so they could hopefully act faster on leads." It was designed to replace a paper-intensive process with an electronic, Web-based process. With such a reasonable goal, why didn't it work?

The CIO of the FBI offered one explanation. He claimed that "the FBI must radically change the agency's culture if the Bureau is ever going to get the high-the analysis and surveillance tools it needs to effectively fight terrorism. We must move from a decentralized amalgam of 56 field offices that are deeply distrustful of technology, outsiders and each other to a seamlessly integrated global intelligence operation capable of sharing information and preventing crimes in real-time."

A former project manager at the FBI further explained, "They work under the idea that everything needs to be kept secret. But everything doesn't have to be kept secret. To do this right, you have to share information."

The VCF system has been shut down, but the CIO is working on a new approach. He is busy trying to win buy-in from agents in the field so that the next case management system will work. In addition, he is working to establish a portfolio management plan that will cover

all of the FBI's IT projects, even those begun in decentralized offices. His team has been designing an enterprise architecture that will lay out standards for a bureauwide information system. The Director of the FBI has helped too. He reorganized the governance of IT, taking IT budget control away from the districts and giving total IT budget authority to the CIO.

The FBI announced that it will build a new case management system called Sentinel in four phases. The new system, according to the CIO, will include workflow, document management, record management, audit trails, access control, and single sign-on. To manage the expectations of the agents, the CIO plans to communicate often and significantly increase the training program for the new system. The CIO commented, "we want to automate those things that are the most manually cumbersome for the agents so they can see that technology can actually enhance their productivity. That is how to change their attitudes."

Discussion Questions:

1. What do you think were the real reasons why the VCF system failed?
2. What were the points of alignment and misalignment between the Information Systems Strategy and the FBI organization?
3. What do you think of the CIO's final comment about how to change attitudes? Do you think it will work? Why or why not?
4. If you were the CIO, what would you do to help the FBI modernize and make better use of information technology?

Source: "Why the G-Men Aren't IT Men" by Allan Holmes, *CIO Magazine*, June 15, 2005, pp. 42–45.