E-Business: How Businesses Use Information Systems

STUDENT LEARNING OBJECTIVES

After completing this chapter, you will be able to answer the following questions:

1. What are the major features of a business that are important for understanding the role of information systems?

2. How do information systems support the major business functions: sales and marketing, manufacturing and production, finance and accounting, and human resources?

3. How do systems serve the various levels of management in a business and how are these systems related?

4. How do enterprise applications, collaboration and communication systems, and intranets improve organizational performance?

5. What is the role of the information systems function in a business?
INFORMATION SYSTEMS JOIN THE TUPPERWARE PARTY

Earl Tupper patented the airtight Tupper seal for food storage containers in 1947, but it wasn’t catching on in retail stores. He turned to an engaging single mother, Brownie Wise, to help him sell his Tupperware through home demonstration parties. The strategy worked: Tupperware grew into a $1.7 billion company that sells through home parties in almost 100 countries using an independent sales force of 1.9 million members. A Tupperware party begins every two seconds somewhere in the world.

A few years ago, Tupperware faced another challenge. The company changed its U.S. operations from a distributorship model to a multilevel compensation structure. Tupperware’s U.S. sales force mushroomed from three levels of compensation (sales consultant, manager, and distributor) to a dozen levels. Sales consultants are paid a commission for their own sales plus a smaller commission based on sales of consultants that they recruited to the business.

As a sales consultant became successful and recruited more people to the business, that person would be responsible for her paperwork plus paperwork from the people she had recruited on her downline sales team. These activities did not leave enough time for
the strategic tasks of selling and recruiting. Tupperware’s order entry system was not able to handle peak demand during sales promotions and busy times of the year. To support growth and improve business processes for both the sales force and corporate staff, Tupperware needed a system that could handle an additional 5,000 users each month, send e-mail messages to 50,000 recipients at a time, and allow restricted access to documents based on an employee’s job position in the company.

In 2004, Tupperware began implementing an integrated Web-based order management system called MyTupperware.com that relieves distributors from the task of entering the orders from everyone they recruited. Now each sales consultant enters her own orders. The Web-based system serves as a portal that integrates with Tupperware’s existing systems so that authorized users can access information from related systems with a single sign-on. Different groups in the company, such as sales promotion, training, and Web support, have tools to publish and retire Web content for specific audiences in the company on their own without requiring help from the company’s information systems staff. The system also streamlines communications among corporate managers, support staff, and sales consultants, and provides better support to sales consultants in promoting product sales, recruiting new sales consultants, and managing downline sales teams.

The portal provides four levels of access. There is a home page accessible to consumers, which provides information on Tupperware products and increases brand awareness. A second level gives all sales consultants access to order entry, e-mail, a calendar, training materials, and list functions. A third level offers sales consultants who wish to pay a fee additional marketing and promotional features and tools to create their own e-commerce Web sites linked to My.Tupperware.com. The highest level lets users perform more promotional activities and links to higher compensation opportunities. Any sales consultant can choose any level of accessibility she wishes.

Tupperware chose Oracle Collaboration Suite and Oracle Portal software as the platform for the system because they enabled the company to integrate functions for data management, financial systems, calendar, and e-mail into a single secure environment that could scale up to meet future growth in Tupperware sales and sales consultants. The company had also been using other Oracle software for a decade, so it felt comfortable with Oracle products.

Tupperware finished rolling out My.Tupperware.com to 50,000 North American users in the final months of 2004. Reaction to the system has been very positive. The company is enhancing the system to provide online Web conferencing and voice and text messaging.

Chapter 2: E-Business: How Businesses Use Information Systems

HEADS UP
This chapter provides you with an overview of how business firms use and organize information systems, and provides you with the basic vocabulary and concepts of business information systems that are used throughout the book. Many of the topics we cover here are covered in greater detail in later chapters, but this brief introduction to the entire field will help prepare you for later chapters and will quickly give you a better idea of the significant role that information systems play in a business.

2.1 Components of a Business

A business is a formal organization whose aim is to produce products or provide services for a profit—that is, to sell products at a price greater than the costs of production. Customers are willing to pay this price because they believe they receive a value greater than or equal to the sale price. Business firms purchase inputs and resources from the larger environment (suppliers who are often other firms). Employees of the firm transform these inputs by adding value to them in the production process. There are of course nonprofit firms and organizations, and government agencies that are complex formal organizations, that produce services and products but do not operate in order to produce a profit. Nevertheless, even these kinds of organizations consume resources from their environments, add value to these inputs, and deliver their outputs to constituents and customers. In general, the information systems found in nonprofit organizations are remarkably similar to those found in private industry.
ORGANIZING A BUSINESS: BASIC BUSINESS FUNCTIONS

Imagine that you wanted to set up your own business. Simply deciding to go into business would be the most important decision, but next would come the question of what product or what service you wanted to offer. The decision of what to produce is called a strategic choice because it determines who are your likely customers, the kinds of employees you will need, the production methods and facilities needed, the marketing themes, and many other choices.

Once you decide what to produce, what kind of organization would you need? First, you would have to design some sort of production division—an arrangement of people, machines, and business processes (procedures) that could produce the product. Second, you would need a sales and marketing group who could attract customers, sell the product, and keep track of after-sales issues, such as warranties and maintenance. Third, once you generate sales, you will need a finance and accounting group to keep track of current financial transactions, such as orders, invoices, disbursements, and payroll. In addition, this group would seek out sources of credit and finance. Finally, you would want a group of people to focus on recruiting, hiring, training, and retaining employees. Figure 2-1 summarizes the four basic functions found in every business.

If you were an entrepreneur or your business was very small with only a few employees, you would not need, and probably could not afford, all these separate groups of people. Instead, in small firms, you would be performing all these functions yourself or with a few others. No wonder small firms have a high mortality rate! In any event, even in small firms, the four basic functions of a firm are required. Larger firms often will have separate departments for each function: manufacturing and production, sales and marketing, finance and accounting, and human resources.

Figure 2-1 is also useful for thinking about the basic entities that make up a business. The five basic entities in a business with which it must deal are: suppliers, customers, employees, invoices/payments, and products and services. There are many other entities that a business must manage and monitor, but these are the basic ones at the foundation of any business.

BUSINESS PROCESSES

Once you identify the basic business functions and entities for your business, your next job will be to describe exactly how you want your employees to perform these functions.
What specific tasks do you want your sales personnel to perform, in what order, and on what schedule? What steps do you want production employees to follow as they transform raw resources into finished products? How will customer orders be fulfilled? How will vendor bills be paid? The actual steps and tasks that describe how work is organized in a business are called **business processes**. A business process is a logically related set of activities that define how specific business tasks are performed.

Every business can be seen as a collection of business processes. Large businesses have thousands of business processes, some more important than others. To a large extent, the efficiency of a business firm depends on how well its business processes are designed and coordinated.

Many business processes are tied to a specific functional area. For example, the sales and marketing function would be responsible for identifying customers, and the human resources function would be responsible for hiring employees. Other business processes cross many different functional areas and require coordination across departments. For instance, consider the seemingly simple business process of fulfilling a customer order (see Figure 2-2). Initially, the sales department would receive a sales order. The order will pass first to accounting to ensure the customer can pay for the order either by a credit verification or request for immediate payment prior to shipping. Once the customer credit is established, the production department has to pull the product from inventory or produce the product. Then the product will need to be shipped (and this may require working with a logistics firm, such as UPS or FedEx). A bill or invoice will then have to be generated by the accounting department, and a notice will be sent to the customer indicating that the product has shipped. Sales will have to be notified of the shipment and prepare to support the customer by answering calls or fulfilling warranty claims.

What at first appears to be a simple process, fulfilling an order, turns out to be a very complicated series of business processes that require the close coordination of major functional groups in a firm. Second, to efficiently perform all the steps in the order fulfillment process requires a great deal of information and, in order to be efficient, the rapid flow of information both within the firm (with business partners, such as delivery firms) and with the customer.

The Interactive Session on Organizations provides more detail on the critical role played by business processes in firm productivity and competitive advantage. Toyota Motor Company has flourished in a highly competitive environment because it created a set of

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**Figure 2-2**

The Order Fulfillment Process

Fulfilling a customer order involves a complex set of steps that requires the close coordination of the sales, accounting, and manufacturing functions.
What company is the world’s largest auto maker? For many years it was General Motors (GM), but in April 2007 that distinction passed to Toyota. Toyota sells over 9.5 million vehicles each year.

The company is also the world’s most profitable automaker and the world’s best automaker. The quality and reliability of Toyota vehicles are the gold standard of the industry, even among its lower-priced models. Customer loyalty is so high that Toyota can make sales without heavy discounting. And Toyota can produce a vehicle in significantly fewer hours than its competitors.

Key to the company’s success in combining quality with efficiency is its vaunted Toyota Production System (TPS), which is based on lean manufacturing—eliminating waste while optimizing value. Toyota has based its business processes and information systems on the principles of just-in-time delivery, quality, and continuous improvement. By organizing its business processes and information systems around these principles, Toyota delivers value to the customer at a competitive price. Vehicle production is based on actual customer orders rather than best guesses of what to stock in dealer showrooms. The company only builds cars that customers want, when they want them, without additional delays or quality problems.

TPS is not an information system, but information technology has a critical role in supporting TPS so that it can drive Toyota’s business processes. Toyota is likely to say that it does not have a technology strategy, but the role of the company’s technology is to help its business strategy, which is to do away with waste, manufacture product without maintaining an inventory, and always improve production.

The key concepts of TPS are a just-in-time supply chain system and the ability to stop production to prevent defects (Jidoka). Jidoka is enhanced on the production floor by devices that enable line workers to stop the assembly line in order to correct mistakes or defects immediately. The devices range from a pull-ropes or a button to monitoring software that provides real-time alerts of malfunctions in equipment or robots.

One of the best illustrations of Toyota’s just-in-time supply chain system is the seat installation process. At the appropriate point in the assembly line, the system sends an electronic message to a Johnson Controls plant not far from the factory to place an order for the precise seat configuration needed for the specific car. Johnson Controls sends seats to the Toyota factory every four hours, in the exact sequence that they are needed on the assembly line. Such a precise system enables Toyota to operate without stored inventory, reduce errors, and satisfy customer demand for customized seat configurations quickly. Toyota developed its own software to manage this scheduling. The Assembly Line Control System (ALCS) is scalable for large and small plants, and runs on a combination of Hewlett-Packard and Windows 2000 host servers.

TPS also draws on other concepts. Kaizen is the component that seeks continuous improvement, often by eliminating waste from the system. A basic example of Kaizen is relocating a tool near the line so that a worker does not waste time going to get it when he or she needs it. A more advanced example is Toyota’s Dealer Daily Internet portal, which, among other capabilities, enables car dealerships to make virtual swaps of the cars they are scheduled to receive so that they reduce the wait time for customers who have placed orders for specific cars.

Andons are visual controls that provide an up-to-the-minute look at how the production process is running. Electronic dashboards, overhead displays, and plasma screens all serve as Andons. They give supervisors an accurate report on what is happening on the assembly line. A green light signals that production is normal, a yellow light signals that a problem is under examination, and a red light means that the assembly line has stopped.

More advanced Andons are connected to the assembly line machinery and use plasma screens to report more detailed information, such as the type of equipment that failed, the operator’s name, and the precise conditions under which the equipment malfunctioned. Toyota acquired the monitoring software, Activplant Performance Management Systems, from the Canadian company, Activplant.

Other auto companies have studied Toyota’s methods but have had trouble imitating them. According to Jeffrey Liker, an expert on lean manufacturing, less than one percent of such organizations rate highly for their business processes. Liker attributes Toyota’s success to the company’s willingness “to commit to practicing the concepts behind TPS every day” despite the fact that it’s difficult to do so.

CASE STUDY QUESTIONS

1. What are the basic principles of Toyota’s production system? To which areas of the organization do these principles apply?

2. How is TPS interconnected with the culture at Toyota? Are TPS and Toyota’s culture interdependent? Could one exist without the other?

3. Describe how information systems support each of the business processes described in this case.

MIS IN ACTION

1. Select another industry, such as the airline industry or banking, and apply the principles of TPS to that industry. For instance, if you choose a bank, what are some examples of waste that you could try to eliminate? How would Jidoka be implemented? What are some examples of Andons that could be used? How would information systems support these practices? What obstacles might prevent Kaizen from being successful?

2. Some experts believe that lean manufacturing by itself is becoming less and less of a competitive advantage because there is a limit to how much waste you can remove from the production process. Go to www.industryweek.com (or use a search engine) and search for the article titled Toyota’s Real Secret: Hint, It’s Not TPS by John Teresko. Do you agree with the premise of the article? Why or why not? Based on the article and your reading of the case study, what strategies has Toyota implemented to counteract the notion that TPS and lean manufacturing do not offer unlimited opportunities for improvement?

FINELY TUNED BUSINESS PROCESSES AND INFORMATION SYSTEMS


ISBN: 0-558-30397-8

![Image of a page from a book with text](image-url)
mary information that can quickly inform them about the overall performance of the firm, such as gross sales revenues, sales by product group and region, and overall profitability. Middle managers need more specific information on the results of specific functional areas and departments of the firm, such as sales contacts by the sales force, production statistics for specific factories or product lines, employment levels and costs, and sales revenues for each month or even each day. Operational managers need transaction-level information, such as the number of parts in inventory each day or the number of hours logged on Tuesday by each employee. Knowledge workers may need access to external scientific databases or internal databases with organizational knowledge. Finally, production or service workers need access to information from production machines, and service workers need access to customer records in order to take orders and answer questions from customers.

**THE BUSINESS ENVIRONMENT**

So far we have talked about business as if it operated in a vacuum. Nothing could be further from the truth. In fact, business firms depend heavily on their environments to supply capital, labor, customers, new technology, services and products, stable markets and legal systems, and general educational resources. Even a pizza parlor cannot survive long without a supportive environment that delivers the cheese, tomato sauce, and flour!

Figure 2-4 summarizes the key actors in the environment of every business. To stay in business, a firm must monitor changes in its environment and share information with the key entities in that environment. For instance, a firm must respond to political shifts, respond to changes in the overall economy (such as changes in labor rates and price inflation), keep track of new technologies, and respond to changes in the global business environment (such as foreign exchange rates). In its immediate environment, firms need to track and share information with suppliers, customers, stockholders, regulators, and logistic partners (such as shipping firms).

Business environments are constantly changing: new developments in technology, politics, customer preferences, and regulations happen all the time. In general, when businesses fail, it is often because they failed to respond adequately to changes in their environments.

For instance, changes in technology, such as the Internet, are forcing entire industries and leading firms to change their business models or suffer failure. The Chapter 3 opening case study describes how new technology—the Internet—is making the music industry’s traditional business model based on distributing music on CDs obsolete. Another example is
the photography business. Digital photography has forced Eastman Kodak to downsize and move into digital cameras and Internet photography services because most of the consumer marketplace no longer wants to use traditional cameras with film.

**THE ROLE OF INFORMATION SYSTEMS IN A BUSINESS**

Until now we have not mentioned information systems. But from the brief review of business functions, entities, and environments, you can see the critical role that information plays in the life of a business. Up until the mid-1950s, firms managed all this information and information flow with paper records. During the past 50 years, more and more business information and the flow of information among key business actors in the environment has been computerized.

Businesses invest in information systems as a way to cope with and manage their internal production functions and to cope with the demands of key actors in their environments. Specifically, as we noted in Chapter 1, firms invest in information systems for the following business objectives:

- To achieve operational excellence (productivity, efficiency, agility)
- To develop new products and services
- To attain customer intimacy and service (continuous marketing, sales, and service; customization and personalization)
- To improve decision making (accuracy and speed)
- To achieve competitive advantage
- To ensure survival

**2.2 Types of Business Information Systems**

Now it is time to look more closely at how businesses use information systems to achieve these goals. Because there are different interests, specialties, and levels in an organization, there are different kinds of systems. No single system can provide all the information an organization needs. In fact large- and medium-size firms have thousands of computer
programs and hundreds of different systems. Even small firms have a collection of different systems: a system for conducting e-mail campaigns to customers, a system for monitoring advertisements placed on Google, a system for keeping track of basic sales transactions, a system for keeping track of vendors, and so forth. At first glance it can be difficult to comprehend all the different systems in a business, and even more difficult to understand how they relate to one another.

We attempt to describe this complex situation by looking at all these different systems from two different perspectives: a functional perspective identifying systems by their major business function, and a constituency perspective that identifies systems in terms of the major organizational groups that they serve.

**SYSTEMS FROM A FUNCTIONAL PERSPECTIVE**

We will start by describing systems using a functional perspective because this is the most straightforward approach, and, in fact, because this is how you will likely first encounter systems in a business. For instance, if you are a marketing major and take a job in marketing, you will be working on the job first with marketing information systems. If you are an accounting major, you will be working with accounting and financial systems first. From a historical perspective, functional systems were the first kinds of systems developed by business firms. These systems were located in specific departments, such as accounting, marketing and sales, production, and human resources. Let’s take a close look at systems from this functional perspective.

**Sales and Marketing Systems**

The sales and marketing function is responsible for selling the organization’s products or services. Marketing is concerned with identifying the customers for the firm’s products or services, determining what customers need or want, planning and developing products and services to meet their needs, and advertising and promoting these products and services. Sales is concerned with contacting customers, selling the products and services, taking orders, and following up on sales. **Sales and marketing information systems** support these activities.

Table 2.1 shows that information systems are used in sales and marketing in a number of ways. Sales and marketing systems help senior management monitor trends affecting new products and sales opportunities, support planning for new products and services, and monitor the performance of competitors. Sales and marketing systems aid middle management by supporting market research and by analyzing advertising and promotional campaigns, pricing decisions, and sales performance. Sales and marketing systems assist operational management and employees in locating and contacting prospective customers, tracking sales, processing orders, and providing customer service support.

Figure 2-5 illustrates a sales information system used by retailers, such as The Gap or Target. Point-of-sale devices (usually handheld scanners at the checkout counter) capture data about each item sold, which update the sales system’s figures about sales and send data about items sold to related systems dealing with items remaining in inventory and with production. These businesses use this information to track which items have been sold, to determine sales revenue, and to identify hot-selling items and other sales trends.

**TABLE 2.1**

Examples of Sales and Marketing Information Systems

<table>
<thead>
<tr>
<th>System</th>
<th>Description</th>
<th>Groups Served</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order processing</td>
<td>Enter, process, and track orders</td>
<td>Operational management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Employees</td>
</tr>
<tr>
<td>Pricing analysis</td>
<td>Determine prices for products and services</td>
<td>Middle management</td>
</tr>
<tr>
<td>Sales trend forecasting</td>
<td>Prepare five-year sales forecasts</td>
<td>Senior management</td>
</tr>
</tbody>
</table>
Manufacturing and Production Systems

The manufacturing and production function is responsible for actually producing the firm’s goods and services. Manufacturing and production systems deal with the planning, development, and maintenance of production facilities; the establishment of production goals; the acquisition, storage, and availability of production materials; and the scheduling of equipment, facilities, materials, and labor required to fashion finished products. **Manufacturing and production information systems** support these activities.

Table 2.2 shows some typical manufacturing and production information systems for each major organizational group. Senior management uses manufacturing and production systems that deal with the firm’s long-term manufacturing goals, such as where to locate new plants or whether to invest in new manufacturing technology. Manufacturing and production systems for middle management analyze and monitor manufacturing and production costs and resources. Operational management uses manufacturing and production systems that deal with the status of production tasks.

Most manufacturing and production systems use some sort of inventory system, as illustrated in Figure 2-6. Data about each item in inventory, such as the number of units

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**Table 2.2**

<table>
<thead>
<tr>
<th>System</th>
<th>Description</th>
<th>Groups Served</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine control</td>
<td>Controls the actions of machines and equipment</td>
<td>Operational management</td>
</tr>
<tr>
<td>Production planning</td>
<td>Decides when and how many products should be produced</td>
<td>Middle management</td>
</tr>
<tr>
<td>Facilities location</td>
<td>Decides where to locate new production facilities</td>
<td>Senior management</td>
</tr>
</tbody>
</table>

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**Figure 2-5**

**Example of a Sales Information System**

This system captures sales data at the moment the sale takes place to help the business monitor sales transactions and to provide information to help management analyze sales trends and the effectiveness of marketing campaigns.
Figure 2-6
Overview of an Inventory System
This system provides information about the number of items available in inventory to support manufacturing and production activities.

The inventory master file contains basic data about each item, including the unique identification code for each item, a description of the item, the number of units on hand, the number of units on order, and the reorder point (the number of units in inventory that triggers a decision to reorder to prevent a stockout). Companies can estimate the number of items to reorder, or they can use a formula for calculating the least expensive quantity to reorder called the economic order quantity. The system produces reports that give information about such things as the number of each item available in inventory, the number of units of each item to reorder, or items in inventory that must be replenished.

Finance and Accounting Systems
The finance function is responsible for managing the firm’s financial assets, such as cash, stocks, bonds, and other investments, to maximize the return on these financial assets. The finance function is also in charge of managing the capitalization of the firm (finding new financial assets in stocks, bonds, or other forms of debt). To determine whether the firm is getting the best return on its investments, the finance function must obtain a considerable amount of information from sources external to the firm.

The accounting function is responsible for maintaining and managing the firm’s financial records—receipts, disbursements, depreciation, payroll—to account for the flow of funds in a firm. Finance and accounting share related problems—how to keep track of a firm’s financial assets and fund flows. They provide answers to questions such as these: What is the current inventory of financial assets? What records exist for disbursements, receipts, payroll, and other fund flows?

Table 2.3 shows some of the typical finance and accounting information systems found in large organizations. Senior management uses finance and accounting systems to establish long-term investment goals for the firm and to provide long-range forecasts of the firm’s financial performance. Middle management uses systems to overseer and control the

<table>
<thead>
<tr>
<th>System</th>
<th>Description</th>
<th>Groups Served</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounts receivable</td>
<td>Tracks money owed the firm</td>
<td>Operational management</td>
</tr>
<tr>
<td>Budgeting</td>
<td>Prepares short-term budgets</td>
<td>Middle management</td>
</tr>
<tr>
<td>Profit planning</td>
<td>Plans long-term profits</td>
<td>Senior management</td>
</tr>
</tbody>
</table>
firm’s financial resources. Operational management uses finance and accounting systems to track the flow of funds in the firm through transactions, such as paychecks, payments to vendors, securities reports, and receipts.

Figure 2-7 illustrates an accounts receivable system, which keeps track of what customers who have made purchases on credit owe to a company. Every invoice generates an “account receivable”—that is, the customer owes the firm money. Some customers pay immediately in cash, but others are granted credit. The accounts receivable system records each invoice in a master file that also contains information on each customer, including that person’s credit rating. The system also keeps track of all the bills outstanding and can produce a variety of output reports, both on paper and on the computer screen, to help the business collect bills. The system also answers queries about a customer’s credit rating and payment history.

Human Resources Systems

The human resources function is responsible for attracting, developing, and maintaining the firm’s workforce. **Human resources information systems** support activities such as identifying potential employees, maintaining complete records on existing employees, and creating programs to develop employees’ talents and skills.

Human resources systems help senior management identify the manpower requirements (skills, educational level, types of positions, number of positions, and cost) for meeting the firm’s long-term business plans. Middle management uses human resources systems to monitor and analyze the recruitment, allocation, and compensation of employees. Operational management uses human resources systems to track the recruitment and placement of the firm’s employees (see Table 2.4).

Figure 2-8 illustrates a typical human resources system for employee record keeping. It maintains basic employee data, such as the employee’s name, age, sex, marital status, address, educational background, salary, job title, date of hire, and date of termination. The system can produce a variety of reports, such as lists of newly hired employees, employees who are terminated or on leaves of absence, employees classified by job type or...
educational level, or employee job performance evaluations. Such systems are typically designed to provide data that can satisfy federal and state record keeping requirements for Equal Employment Opportunity (EEO) and other purposes.

The Interactive Session on People describes a human resources system with a strategic orientation. Google is one of the world’s most leading-edge, rapidly growing companies. It is best known for its powerful Internet search engine, but it is also the source of numerous other technology-based products and services. Innovation and knowledge are key business drivers. Google obviously has very special human resources requirements and prizes highly intelligent employees who can work in teams yet think outside the box. As you read this case, try to identify the problem this company was facing; what alternative solutions were available to management; how well the chosen solution worked; and the people, organization, and technology issues that had to be addressed when developing the solution.

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**SYSTEMS FROM A CONSTITUENCY PERSPECTIVE**

Although a functional perspective is very useful for understanding how business systems serve specific functions, this perspective does not tell us how systems help managers manage the firm. Here we need a perspective that examines systems in terms of the various levels of management and types of decisions that they support. Each of three main management
INTERACTIVE SESSION: PEOPLE

Google’s New Search for the Best and the Brightest

What would it take to work for Google? Its employees are among the best and the brightest. The typical Google employee achieved perfect grades in school, on top of perfect SAT scores. If you were looking for an engineering position at Google, your grade point average had to be 3.7 or better. Experienced workers whose past grades and test scores did not reach Google’s high standards were ruled out.

The few applicants who made the initial cutoff told tales of an exceptionally rigorous hiring process that in some cases included as many as a dozen on-site interviews. Google was also known to challenge prospective hires with complicated brainteasers. These practices helped the company build an organization where the sharpest minds could flourish amidst Google’s freewheeling and competitive culture.

Google’s work force has roughly doubled over the past few years, reaching more than 12,200 by the end of March 2007. Lazlo Bock, who was recruited from General Electric to be Google’s vice president of people operations in March 2006, anticipated that the company would double in size once again in 2007 and require approximately 200 new hires per week. This rapid workforce expansion forced Google to re-examine its employee recruiting processes. Was there another way for Google to take the 100,000 job applications it receives monthly and recruit enough worthwhile candidates to satisfy its desperate need for engineers, sales representatives, and other positions?

Bock believes in research findings saying that grades and interviews are not totally reliable predictors of job performance. And indeed, Google has found that high academic performance is not always correlated with success on the job. So Google decided to gather quantitative information about people’s backgrounds to pinpoint good candidates for employment.

In the summer of 2006, Google employees who had been on the job for at least five months filled out a 300-question survey designed by an organizational psychologist that covered a broad spectrum of questions. The survey included questions about skills (What programming languages are you familiar with?), behavior (Is your workspace messy or neat?), personality (Are you an extrovert or an introvert?), and non-traditional factors (What magazines do you subscribe to?).

Bock was willing to consider that a great variety of factors could be associated with personality traits that would be effective predictors of success. He pointed out that it is fairly common to find employees with their dogs in the Google offices. Therefore, it was worth asking whether pet ownership is related to a personality trait that makes for a successful Google employee. Google also asked questions such as, “Have you ever set a world record in anything?” “At what age did you first get excited about computers?” “Have you ever made a profit from a catering business or dog walking?” and “Have you ever established a nonprofit organization?” The questions were designed to create a profile of a worker that included his or her attitudes, behavior, personality, and life experiences.

Mathematicians at Google gathered the data from the current employee survey and lined them up against 25 different measures of job performance, including supervisor and peer reviews, compensation, and the ability to make the company a better place to work. The results of the data analysis populated a score matrix that rated potential employees on a scale of zero to 100 on how likely they were to thrive at Google. The initial survey showed that there was no single way to determine who would be the best candidates for every type of position that Google offers. However, the company created separate surveys to distill the best candidates in specific areas including engineering, sales, finance, and human resources.

Google’s use of quantitative data is not unique. Other companies have used a wide range of tests to assess skills, intelligence, and personality, including biographical surveys similar to Google’s.

Initially, only a small percentage of job applicants were evaluated with the survey approach, but it was slated for a full rollout in January 2007. It was still too early to tell whether Google’s revamped recruiting and hiring techniques yielded the desired results. Michael Mumford, a University of Oklahoma psychology professor specializing in talent assessment, notes that this type of test can be effective, but that companies should not rely too heavily on oddball factors. The company also had to address resistance to the idea that a computer running an algorithm is better equipped to identify talent than a human.

In the meantime, Google has been exploring additional ways to condense the hiring process, including cutting the number of interviews for some positions down to two, and changing the format of interviewer feedback from free-form text and a single score to a multifaceted evaluation with four attributes and multiple scores. Bock believes that Google hiring practices are producing results: more people are being hired for what their experience indicated they would be able to accomplish.

1. Did Google’s traditional hiring practices create business problems? Explain your answer.

2. Is Google’s quantitative approach to hiring a good solution to its employee recruiting problems? Why or why not?

3. What role does culture play in Google’s hiring preferences?

4. What kind of system or systems described in this chapter are discussed in this case? What are the inputs, processes, and outputs?

5. Create a list of ten questions that you think might be appropriate for Google’s job applicant survey. Justify each question with a short explanation of why the answer would be useful.

6. If you were applying for a job at Google, how would you want to be evaluated? Which evaluation techniques do you think favor your strengths? Which techniques might expose your weaknesses?

Explore the Google Jobs page at http://www.google.com/intl/en/jobs/index.html, and then answer the following questions:

1. What resources does Google provide for prospective employees on its Web site?

2. Find a Google job listing that interests you and determine whether you will have the necessary skills to interview for the job when you graduate. What skills are you lacking? How did the job posting make you feel about your chances of landing the job you want?

3. Imagine that you are preparing for a job interview at Google. Use the company’s Web site to learn about the company and come up with three questions that you can ask your interviewer about the company. List your three questions along with links to the pages of the Web site that inspired your questions and descriptions of the content of those pages.

Transaction Processing Systems

Operational managers need systems that keep track of the elementary activities and transactions of the organization, such as sales, receipts, cash deposits, payroll, credit decisions, and the flow of materials in a factory. **Transaction processing systems (TPS)** provide this kind of information. A transaction processing system is a computerized system that performs and records the daily routine transactions necessary to conduct business, such as sales order entry, hotel reservations, payroll, employee record keeping, and shipping.

The principal purpose of systems at this level is to answer routine questions and to track the flow of transactions through the organization. How many parts are in inventory? What happened to Mr. Williams’s payment? To answer these kinds of questions, information generally must be easily available, current, and accurate.

At the operational level, tasks, resources, and goals are predefined and highly structured. The decision to grant credit to a customer, for instance, is made by a lower-level supervisor according to predefined criteria. All that must be determined is whether the customer meets the criteria. The systems illustrated in Figures 2-7 and 2-8 are transaction processing systems.

Managers need TPS to monitor the status of internal operations and the firm’s relations with the external environment. TPS are also major producers of information for the other types of systems. (For example, the accounts receivable system illustrated in Figure 2-7, along with other accounting TPS, supplies data to the company’s general ledger system, which is responsible for maintaining records of the firm’s income and expenses and for producing reports such as income statements and balance sheets.)

Transaction processing systems are often so central to a business that TPS failure for a few hours can lead to a firm’s demise and perhaps that of other firms linked to it. Imagine
what would happen to UPS if its package tracking system were not working! What would the airlines do without their computerized reservation systems?

Management Information Systems and Decision-Support Systems

Middle management needs systems to help with monitoring, controlling, decision-making, and administrative activities. The principal question addressed by such systems is this: Are things working well?

In Chapter 1, we defined management information systems as the study of information systems in business and management. The term management information systems (MIS) also designates a specific category of information systems serving middle management. MIS provide middle managers with reports on the organization’s current performance. This information is used to monitor and control the business and predict future performance.

MIS summarize and report on the company’s basic operations using data supplied by transaction processing systems. The basic transaction data from TPS are compressed and usually presented in reports that are produced on a regular schedule. Today, many of these reports are delivered online. Figure 2-9 shows how a typical MIS transforms transaction-level data from inventory, production, and accounting into MIS files that are used to provide managers with reports. Figure 2-10 shows a sample report from this system.

MIS serve managers primarily interested in weekly, monthly, and yearly results, although some MIS enable managers to drill down to see daily or hourly data if required. MIS generally provide answers to routine questions that have been specified in advance and have a predefined procedure for answering them. For instance, MIS reports might list the total pounds of lettuce used this quarter by a fast-food chain or, as illustrated in Figure 2-10, compare total annual sales figures for specific products to planned targets. These systems generally are not flexible and have little analytical capability. Most MIS use simple routines, such as summaries and comparisons, as opposed to sophisticated mathematical models or statistical techniques.

Decision-support systems (DSS) support nonroutine decision making for middle management. They focus on problems that are unique and rapidly changing, for which the procedure for arriving at a solution may not be fully predefined in advance. They try to
answer questions such as these: What would be the impact on production schedules if we were to double sales in the month of December? What would happen to our return on investment if a factory schedule were delayed for six months?

Although DSS use internal information from TPS and MIS, they often bring in information from external sources, such as current stock prices or product prices of competitors. These systems use a variety of models to analyze data, or they condense large amounts of data into a form in which decision makers can analyze them. DSS are designed so that users can work with them directly; these systems explicitly include user-friendly software.

An interesting, small, but powerful DSS is the voyage-estimating system of a subsidiary of a large American metals company that exists primarily to carry bulk cargoes of coal, oil, ores, and finished products for its parent company. The firm owns some vessels, charters others, and bids for shipping contracts in the open market to carry general cargo. A voyage-estimating system calculates financial and technical voyage details. Financial calculations include ship/time costs (fuel, labor, capital), freight rates for various types of cargo, and port expenses. Technical details include a myriad of factors, such as ship cargo capacity, speed, port distances, fuel and water consumption, and loading patterns (location of cargo for different ports).

The system can answer questions such as the following: Given a customer delivery schedule and an offered freight rate, which vessel should be assigned at what rate to maximize profits? What is the optimal speed at which a particular vessel can optimize its profit and still meet its delivery schedule? What is the optimal loading pattern for a ship bound for the U.S. West Coast from Malaysia? Figure 2-11 illustrates the DSS built for this company. The system operates on a powerful desktop personal computer, providing a system of menus that makes it easy for users to enter data or obtain information.

This voyage-estimating DSS draws heavily on analytical models. Other types of DSS are less model driven, focusing instead on extracting useful information to support decision making from massive quantities of data. For example, Intrawest—the largest ski operator in North America—collects and stores vast amounts of customer data from its Web site, call center, lodging reservations, ski schools, and ski equipment rental stores. It uses special software to analyze these data to determine the value, revenue potential, and loyalty of each customer so managers can make better decisions on how to target their marketing programs. The system segments customers into seven categories based on

<table>
<thead>
<tr>
<th>PRODUCT CODE</th>
<th>PRODUCT DESCRIPTION</th>
<th>SALES REGION</th>
<th>ACTUAL SALES</th>
<th>PLANNED</th>
<th>ACTUAL versus PLANNED</th>
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<tr>
<td>4469 Carpet Cleaner</td>
<td>Northeast</td>
<td>4,066,700</td>
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<td>TOTAL</td>
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<td>TOTAL</td>
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<td>18,559,253</td>
<td>17,700,000</td>
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Figure 2-10
Sample MIS Report
This report, showing summarized annual sales data, was produced by the MIS in Figure 2-9.

Consolidated Consumer Products Corporation Sales by Product and Sales Region: 2008

<table>
<thead>
<tr>
<th>PRODUCT CODE</th>
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<th>ACTUAL SALES</th>
<th>PLANNED</th>
<th>ACTUAL versus PLANNED</th>
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needs, attitudes, and behaviors, ranging from “passionate experts” to “value-minded family vacationers.” The company then e-mails video clips that would appeal to each segment to encourage more visits to its resorts.

Sometimes you’ll hear DSS referred to as business intelligence systems because they focus on helping users make better business decisions. You’ll learn more about them in Chapters 5 and 10.

Executive Support Systems
Senior managers need systems that address strategic issues and long-term trends, both in the firm and in the external environment. They are concerned with questions such as these: What will employment levels be in five years? What are the long-term industry cost trends, and where does our firm fit in? What products should we be making in five years? What new acquisitions would protect us from cyclical business swings?

Executive support systems (ESS) help senior management make these decisions. ESS address nonroutine decisions requiring judgment, evaluation, and insight because there is no agreed-on procedure for arriving at a solution. ESS provide a generalized computing and communications capacity that can be applied to a changing array of problems.

ESS are designed to incorporate data about external events, such as new tax laws or competitors, but they also draw summarized information from internal MIS and DSS. They filter, compress, and track critical data, displaying the data of greatest importance to senior managers. For example, the CEO of Leiner Health Products, the largest manufacturer of private-label vitamins and supplements in the United States, has an ESS that provides on his desktop a minute-to-minute view of the firm’s financial performance as measured by working capital, accounts receivable, accounts payable, cash flow, and inventory.

ESS present graphs and data from many sources through an interface that is easy for senior managers to use. Often the information is delivered to senior executives through a portal, which uses a Web interface to present integrated personalized business content. You will learn more about other applications of portals in Chapters 9 and 10.

Figure 2-12 illustrates a model of an ESS. It consists of workstations with menus, interactive graphics, and communications capabilities that can be used to access historical
and competitive data from internal corporate systems and external databases such as Dow Jones News/Retrieval or the Gallup Poll. More details on leading-edge applications of DSS and ESS can be found in Chapter 10.

**RELATIONSHIP OF SYSTEMS TO ONE ANOTHER**

The systems we have just described are interrelated, as illustrated in Figure 2-13. TPS are typically a major source of data for other systems, whereas ESS are primarily a recipient of data from lower-level systems. The other types of systems may exchange data with each other as well. Data also may be exchanged among systems serving different functional areas. For example, an order captured by a sales system may be transmitted to a manufacturing system as a transaction for producing or delivering the product specified in the order or to an MIS for financial reporting. In most organizations, these systems have been loosely integrated.

### 2.3 Systems That Span the Enterprise

Reviewing all the different types of systems we have just described, you might wonder how a business can manage all the information in these different systems. You might also wonder how costly it is to maintain so many different systems. And you might wonder how these different systems can share information and how managers and employees can coordinate their work. In fact, these are all excellent questions and challenges for businesses today.

**ENTERPRISE APPLICATIONS**

Getting all the different kinds of systems in a company to work together is a major challenge. Typically, corporations are put together both through normal “organic” growth and through acquisition of smaller firms. Over a period of time, corporations end up with a collection of systems, most of them older, and face the challenge of getting them all to “talk” with one another and work together as one corporate system. There are several solutions to this problem.
One solution is to implement enterprise applications, which are systems that span functional areas, focus on executing business processes across the business firm, and include all levels of management. Enterprise applications help businesses become more flexible and productive by coordinating their business processes more closely and integrating groups of processes so they focus on efficient management of resources and customer service.

There are four major enterprise applications: enterprise systems, supply chain management systems, customer relationship management systems, and knowledge management systems. Each of these enterprise applications integrates a related set of functions and business processes to enhance the performance of the organization as a whole. Figure 2-14 shows that the architecture for these enterprise applications encompasses processes spanning the entire organization and, in some cases, extending beyond the organization to customers, suppliers, and other key business partners.

Enterprise Systems

A large organization typically has many different kinds of information systems built around different functions, organizational levels, and business processes that cannot automatically exchange information. Managers might have a hard time assembling the data they need for a comprehensive, overall picture of the organization’s operations. For instance, sales personnel might not be able to tell at the time they place an order whether the items that were ordered are in inventory, customers cannot track their orders, and manufacturing cannot communicate easily with finance to plan for new production. This fragmentation of data in hundreds of separate systems degrades organizational efficiency and business performance.

For example, Alcoa, the world’s leading producer of aluminum and aluminum products with operations spanning 41 countries and 500 locations, had initially been organized around lines of business, each of which had its own set of information systems. Many of these systems were redundant and inefficient. Alcoa’s costs for executing requisition-to-pay and financial processes were much higher and its cycle times were longer than those of other companies in its industry. (Cycle time refers to the total elapsed time from the beginning to the end of a process.) The company could not operate as a single worldwide entity (Oracle, 2005; Sullivan, 2005).

Enterprise systems, also known as enterprise resource planning (ERP) systems, solve this problem by collecting data from various key business processes in manufacturing and production, finance and accounting, sales and marketing, and human resources and storing the data in a single central data repository. This makes it possible for information that was previously fragmented in different systems to be shared across the firm and for different parts of the business to work more closely together (see Figure 2-15).
Enterprise systems speed communication of information throughout the company, making it easier for businesses to coordinate their daily operations. When a customer places an order, the data flow automatically to other parts of the company that are affected by them. The order transaction triggers the warehouse to pick the ordered products and schedule shipment. The warehouse informs the factory to replenish whatever has depleted.
The accounting department is notified to send the customer an invoice. Customer service representatives track the progress of the order through every step to inform customers about the status of their orders.

Enterprise systems give companies the flexibility to respond rapidly to customer requests while producing and stocking inventory only with what is needed to fulfill existing orders. Their ability to increase accurate and on-time shipments, minimize costs, and increase customer satisfaction adds to firm profitability.

After implementing enterprise software from Oracle, Alcoa eliminated many redundant processes and systems. The enterprise system helped Alcoa reduce requisition-to-pay cycle time (the total elapsed time from the time a purchase requisition is generated to the time the payment for the purchase is made) by verifying receipt of goods and automatically generating receipts for payment. Alcoa’s accounts payable transaction processing dropped 89 percent. Alcoa was able to centralize financial and procurement activities, which helped the company reduce nearly 20 percent of its worldwide costs. The company expects continued use of the enterprise system to reduce inventory by 25 percent, increase productivity by 15 percent, reduce materials costs by 5 percent, and improve customer service by 20 percent.

Enterprise systems provide much valuable information for improving management decision making. Corporate headquarters has access to up-to-the-minute data on sales, inventory, and production and uses this information to create more accurate sales and production forecasts. Enterprise systems provide company-wide information to help managers analyze overall product profitability or cost structures. For example, Alcoa’s new enterprise system includes functionality for global human resources management that shows correlations between investment in employee training and quality; measures the company-wide costs of delivering services to employees; and measures the effectiveness of employee recruitment, compensation, and training.

Supply Chain Management Systems
Supply chain management (SCM) systems help businesses manage relationships with their suppliers. These systems provide information to help suppliers, purchasing firms, distributors, and logistics companies share information about orders, production, inventory levels, and delivery of products and services so that they can source, produce, and deliver goods and services efficiently. The ultimate objective is to get the right amount of their products from their source to their point of consumption with the least amount of time and with the lowest cost.

If a company and its supply network do not have accurate information, they will most likely be saddled by excessive inventories, inaccurate manufacturing plans, and missed production schedules. Inability to move products efficiently through the supply chain raises costs while degrading customer service.

For example, until it implemented a supply chain management system from SAP, Alcan Packaging had trouble fulfilling customer orders for its packaging materials for food, pharmaceuticals, and cosmetics. It did not have the information to make good decisions about how much to produce, how to allocate personnel, or how to meet the delivery dates requested by customers. It would go from working employees overtime one month to cutting back staff the next. It could not accurately project when it would meet shipment requirements (SAP, 2005).

Table 2.5 describes how firms can benefit from supply chain management systems. These systems increase firm profitability by lowering the costs of moving and making products and by enabling managers to make better decisions about how to organize and schedule sourcing, production, and distribution. Alcan expects its supply chain management system to reduce overtime by 25 percent, reduce setup costs by up to 7.5 percent, and reduce carrying inventory by up to 10 percent.

Supply chain management systems are one type of interorganizational system because they automate the flow of information across organizational boundaries. You will find examples of other types of interorganizational information systems throughout this text.
because such systems make it possible for firms to link electronically to customers and to outsource their work to other companies.

Figure 2-16 illustrates supply chain management systems used by Haworth Incorporated, a world-leading manufacturer and designer of office furniture. Haworth’s 15 North American manufacturing facilities are located in North Carolina, Arkansas, Michigan, Mississippi, Texas, Ontario, Alberta, and Quebec. These facilities supply inventory to distribution centers in Michigan, Pennsylvania, Georgia, and Arkansas.

Haworth’s Transportation Management System (TMS) examines customer orders, factory schedules, carrier rates and availability, and shipping costs to produce optimal lowest-cost delivery plans. These plans are generated daily and updated every 15 minutes. The TMS works with Haworth’s Warehouse Management System (WMS), which tracks and controls the flow of finished goods from Haworth’s distribution centers to its customers. Acting on shipping plans from TMS, WMS directs the movement of goods based on immediate conditions for space, equipment, inventory, and personnel. Haworth uses special “middleware” software to link its TMS and WMS to order entry, manufacturing planning, and shipping systems and to pass customer orders, shipping plans, and shipping notifications among the applications.

Customer Relationship Management Systems

Customer relationship management (CRM) systems help firms manage their relationships with their customers. CRM systems provide information to coordinate all of the business processes that deal with customers in sales, marketing, and service to optimize revenue, customer satisfaction, and customer retention. This information helps firms
identify, attract, and retain the most profitable customers; provide better service to existing customers; and increase sales.

In the past, a firm’s processes for sales, service, and marketing were highly compartmentalized, and these departments did not share much essential customer information. Some information on a specific customer might be stored and organized in terms of that person’s account with the company. Other pieces of information about the same customer might be organized by products that were purchased. There was no way to consolidate all of this information to provide a unified view of a customer across the company.

For example, until recently, Saab U.S.A., which imports and distributes Saab vehicles to U.S. dealerships, had a splintered view of its customers. It had been engaging customers through three channels: its dealer network, a customer assistance center dealing with service inquiries, and a lead management center handling marketing and information requests from prospective customers. Each of these channels maintained customer data in its own systems. Fragmented customer data meant that a prospective customer might receive a direct mail offer from Saab one week and e-mail with an unrelated offer from a third-party marketing company the next week. The local dealer might not know about either of these offers, which prevented the dealer from delivering an effective pitch when the prospect visited the showroom. Lead quality was highly variable, so many dealers ignored the leads and the company had no way of tracking leads faxed to dealers.

CRM systems try to solve this problem by integrating the firm’s customer-related processes and consolidating customer information from multiple communication channels—telephone, e-mail, wireless devices, retail outlets, or the Web. Detailed and accurate knowledge of customers and their preferences helps firms increase the effectiveness of their marketing campaigns and provide higher-quality customer service and support.

After Saab U.S.A. implemented three CRM applications for automotive dealers from Oracle-Siebel Systems, it was able to have a 360-degree view of each customer, including prior service-related questions and all the marketing communication the customer had ever received. Saab can track the status of referred leads by monitoring events, such as the salesperson’s initial call to the customer and the scheduling and completion of a test drive.

Illustrated here are some of the capabilities of Salesforce.com, a market-leading provider of on-demand customer relationship management (CRM) software. CRM systems integrate information from sales, marketing, and customer service.
The systems provide detailed information to measure the sales results of specific leads, and target leads are directed more precisely to the right salespeople at the right dealerships. Since the CRM applications were implemented, Saab’s follow-up rate on sales leads has increased from 38 to 50 percent and customer satisfaction rose from 69 to 75 percent (Picarille, 2004; Siebel, 2005).

Knowledge Management Systems
The value of a firm’s products and services is based not only on its physical resources but also on intangible knowledge assets. Some firms perform better than others because they have better knowledge about how to create, produce, and deliver products and services. This firm knowledge is difficult to imitate, unique, and can be leveraged into long-term strategic benefits. Knowledge management systems (KMS) enable organizations to better manage processes for capturing and applying knowledge and expertise. These systems collect all relevant knowledge and experience in the firm, and make it available wherever and whenever it is needed to improve business processes and management decisions. They also link the firm to external sources of knowledge.

KMS support processes for acquiring, storing, distributing, and applying knowledge, as well as processes for creating new knowledge and integrating it into the organization. They include enterprise-wide systems for managing and distributing documents, graphics, and other digital knowledge objects; systems for creating corporate knowledge directories of employees with special areas of expertise; office systems for distributing knowledge and information; and knowledge work systems to facilitate knowledge creation. Other knowledge management applications use intelligent techniques that codify knowledge for use by other members of the organization and tools for knowledge discovery that recognize patterns and important relationships in large pools of data.

We examine enterprise systems and systems for supply chain management and customer relationship management in greater detail in Chapter 8 and cover knowledge management applications in Chapter 10.

INTRANETS AND EXTRANETS
Enterprise applications create deep-seated changes in the way the firm conducts its business, and they are often costly to implement. Companies that do not have the resources to invest in enterprise applications can still achieve some measure of information integration by using intranets and extranets, which we introduced in Chapter 1.

Intranets and extranets are really more technology platforms than specific applications, but they deserve mention here as one of the tools firms use to increase integration and expedite the flow of information within the firm, and with customers and suppliers. Intranets are internal networks built with the same tools and communication standards as the Internet and are used for the internal distribution of information to employees, and as repositories of corporate policies, programs, and data. Extranets are intranets extended to authorized users outside the company. We describe the technology for intranets and extranets in more detail in Chapter 6.

An intranet typically centers on a portal that provides a single point of access to information from several different systems and to documents using a Web interface. Such portals can be customized to suit the information needs of specific business groups and individual users, if required. They may also feature e-mail, collaboration tools, and tools for searching internal corporate systems and documents.

For example, SwissAir’s corporate intranet for sales provides its salespeople with sales leads, fares, statistics, libraries of best practices, access to incentive programs, discussion groups, and collaborative workspaces. The intranet includes a Sales Ticket capability that displays bulletins about unfilled airplane seats around the world to help the sales staff work with colleagues and with travel agents who can help them fill those seats.

Companies can connect their intranets to internal company transaction systems, enabling employees to take actions central to a company’s operations, such as checking the
status of an order or granting a customer credit. SwissAir’s intranet connects to its reservation system. GUESS Jeans has an intranet called ApparelBuy.com that links to its core order processing systems.

Extranets expedite the flow of information between the firm and its suppliers and customers. SwissAir uses an extranet to provide travel agents with fare data from its intranet electronically. GUESS Jeans allows store buyers to order merchandise electronically from ApparelBuy.com. The buyers can use this extranet to track their orders through fulfillment or delivery.

### COLLABORATION AND COMMUNICATION SYSTEMS: “INTERACTION” JOBS IN A GLOBAL ECONOMY

With all these systems and information, you might wonder how is it possible to make sense out of them? How do people working in firms pull it all together, work towards common goals, and coordinate plans and actions? Information systems can’t make decisions, hire or fire people, sign contracts, agree on deals, or adjust the price of goods to the marketplace.

The number of people who perform these tasks in a firm is growing. A recent report from the consulting firm McKinsey and Company argued that 41 percent of the U.S. labor force is now composed of jobs where interaction (talking, e-mailing, presenting, and persuading) is the primary value-adding activity. Blue collar production jobs are now down to 15 percent of the labor force, and transactional jobs (filling out forms or reports or accepting payments) are now 25 percent of the labor force. Moreover, the “interaction” jobs are the fastest-growing: 70 percent of all new jobs created since 1998 are interaction jobs.

With globalization, firms have teams around the globe in different time zones working on the same problem, so the need for continuous interaction and communication around the clock has greatly expanded. Working 24/7 is not just a problem for call centers but involves a much larger group of managers and employees than in the past.

These interaction jobs involve knowledge and problem-solving experience that can’t be put into an information system. Jobs such as sales representative, marketing manager, stock analyst, corporate lawyer, business strategist, or operations manager require sharing information and interacting with other people. Here are some business decisions that require knowledge based on collaboration and interaction:

- How much should we charge for this service?
- What kind of discount should we give this customer who is considering our competitor?
- Should we sign a three-year contract with a vendor, or would we be safer with a one-year contract?
- Should we make a special deal with our largest distributor, or work with all distributors on an equal basis?
- Should we put our price list on the Web site where our competitors can see it?
- Where should we be looking for new lines of business?

The answers to these questions generally cannot be found in structured information systems like those we have described earlier in this chapter. True, these systems help managers and employees by making essential information available. But what’s needed to complete these decisions is face-to-face interaction with other employees, managers, vendors, and customers, along with systems that allow them to communicate, collaborate, and share ideas.

We now briefly introduce some of the enterprise-wide information system solutions used by business firms for this purpose. They include Internet-based collaboration environments, e-mail and instant messaging (IM), cell phones and wireless handhelds, social networking, wikis, and virtual worlds. Chapters 6, 9, and 10 describe these solutions in greater detail.

In the past, these collaboration and communication systems were not considered an essential part of the information systems field, or even an IT management concern. Today this has changed, and our view of information systems is extended to include these vital management tools.
Internet-Based Collaboration Environments

Teams of employees who work together from many different locations around the world need tools to support workgroup collaboration. These tools provide storage space for team documents, a space separate from corporate e-mail for team communications, group calendars, and an audio-visual environment where members can “meet” face to face in a live video conference. Groupware products such as IBM’s Lotus Notes Collaboration Suite, Microsoft Office Groove, and the WebEx Internet conferencing system provide these capabilities.

E-mail and Instant Messaging (IM)

Worldwide, there are an estimated 120 billion legitimate e-mail messages sent each day with about 80 billion originating in the United States. One in six people in the world use e-mail. There are also about 12 billion instant messages sent every day, 8 billion of which originate in business networks. E-mail and instant messaging have been embraced by corporations as a major communication and collaboration tool supporting interaction jobs (Radicatti Group, 2007).

Cell Phones and Wireless Handhelds

Over 8 million people are BlackBerry subscribers in the United States, using wireless devices made by Research in Motion for e-mail, text messaging, instant messaging, phone, and wireless Internet connections. Of the 250 million cell phone subscribers in the United States, 90 million are business subscribers (eMarketer, 2007). Cell phones today are a basic part of a firm’s telecommunications infrastructure for supporting professionals and other employees whose primary job is to talk with one another, with customers and vendors, and with their managers. Cell phones and BlackBerrys are digital devices, and the data generated by their communications may be stored in large corporate systems for later review and use in legal proceedings.

Social Networking

Most of us have visited social networking sites such as MySpace, Facebook, and Friendster, which feature tools to help people share their interests and interact. Social networking sites such as LinkedIn.com provide networking services to business professionals, while other niche sites have sprung up to serve lawyers, doctors, engineers, and even dentists. IBM is building a Community Tools component into its Lotus Notes collaboration software to add social networking features. Users will be able to submit questions to others in the company and receive answers via instant messaging. Social networking tools are quickly becoming a corporate tool for sharing ideas and collaborating among interaction-based jobs in the firm.

Wikis

Wikis are a type of Web site that makes it easy for users to contribute and edit text content and graphics without any knowledge of Web page development or programming techniques. The most well-known wiki is Wikipedia, one of the largest collaboratively edited reference projects in the world. It relies on volunteers, makes no money, accepts no advertising, and is used by 35 million people in the United States alone. It has become the world’s most successful online encyclopedia, with over 20 percent of the online reference market.

Wikis are ideal tools for storing and sharing company knowledge and insights. Enterprise software vendor SAP AG has a wiki that acts as a base of information for people outside the company, such as customers and software developers who build programs that interact with SAP software. In the past, those people asked and sometimes answered questions in an informal way on SAP online forums, but that was an inefficient system, with people asking and answering the same questions over and over.

At Intel Corporation, employees built their own internal wiki in 2006, and it has been edited about 100,000 times and viewed more than 27 million times by Intel employees. The most common search is for the meaning of Intel acronyms, such as EASE for “employee access support environment” and POR for “plan of record.” Other popular resources include
a page about software-engineering processes at the company. Wikis are destined to become
the major repository for unstructured corporate knowledge in the next five years in part
because they are so much less costly than formal knowledge management systems and they
can be much more dynamic and current.

Virtual Worlds
The case study concluding Chapter 1 features a detailed description of Second Life, an
online 3-D virtual world where 7 million “residents” have established lives by building
graphical representations of themselves known as avatars. Organizations such as IBM and
Insead, an international business school with campuses in France and Singapore, are using
this virtual world to house online meetings, training sessions, and “lounges.” Real-world
people represented by avatars meet, interact, and exchange ideas at these virtual locations.
Communication takes place in the form of text messages similar to instant messages.

E-BUSINESS, E-COMMERCE, AND E-GOVERNMENT

The systems and technologies we have just described are transforming firms’ relationships
with customers, employees, suppliers, and logistic partners into digital relationships using
networks and the Internet. So much business is now enabled by or based upon digital
networks that we use the terms electronic business and electronic commerce frequently
throughout this text. Electronic business, or e-business, refers to the use of digital
technology and the Internet to execute the major business processes in the enterprise.
E-business includes activities for the internal management of the firm and for coordination
with suppliers and other business partners. It also includes electronic commerce, or
e-commerce. E-commerce is the part of e-business that deals with the buying and selling of
goods and services over the Internet. It also encompasses activities supporting those market
transactions, such as advertising, marketing, customer support, security, delivery, and
payment.

The technologies associated with e-business have also brought about similar changes in
the public sector. Governments on all levels are using Internet technology to deliver
information and services to citizens, employees, and businesses with which they work.
E-government refers to the application of the Internet and networking technologies to
digitally enable government and public sector agencies’ relationships with citizens,
businesses, and other arms of government. In addition to improving delivery of government
services, e-government can make government operations more efficient and also empower
citizens by giving them easier access to information and the ability to network electronically
with other citizens. For example, citizens in some states can renew their driver’s licenses or
apply for unemployment benefits online, and the Internet has become a powerful tool for
instantly mobilizing interest groups for political action and fund-raising.

2.4 The Information Systems Function in Business

We’ve seen that businesses need information systems to operate today and that they use
many different kinds of systems. But who is responsible for running these systems? Who is
responsible for making sure the hardware, software, and other technologies used by these
systems are running properly and are up to date? End users manage their systems from a
business standpoint, but managing the technology requires a special information systems
function.

In all but the smallest of firms, the information systems department is the formal
organizational unit responsible for information technology services. The information
systems department is responsible for maintaining the hardware, software, data storage, and
networks that comprise the firm’s IT infrastructure. We describe IT infrastructure in detail in
Chapter 4.
THE INFORMATION SYSTEMS DEPARTMENT

The information systems department consists of specialists, such as programmers, systems analysts, project leaders, and information systems managers. **Programmers** are highly trained technical specialists who write the software instructions for computers. **Systems analysts** constitute the principal liaisons between the information systems groups and the rest of the organization. It is the systems analyst’s job to translate business problems and requirements into information requirements and systems. **Information systems managers** are leaders of teams of programmers and analysts, project managers, physical facility managers, telecommunications managers, or database specialists. They are also managers of computer operations and data entry staff. In addition, external specialists, such as hardware vendors and manufacturers, software firms, and consultants, frequently participate in the day-to-day operations and long-term planning of information systems.

In many companies, the information systems department is headed by a **chief information officer** (CIO). The CIO is a senior manager who oversees the use of information technology in the firm. Today’s CIOs are expected to have a strong business background as well as information systems expertise and to play a leadership role in integrating technology into the firm’s business strategy. Large firms today also have positions for a **chief security officer**, **chief knowledge officer**, and **chief privacy officer**, all of whom work closely with the CIO.

The **chief security officer** (CSO) is in charge of information systems security for the firm and is responsible for enforcing the firm’s information security policy (see Chapter 7). (Sometimes this position is called the **chief information security officer** (CISO), where information systems security is separated from physical security.) The CSO is responsible for educating and training users and information systems specialists about security, keeping management aware of security threats and breakdowns, and maintaining the tools and policies chosen to implement security.

Information systems security and the need to safeguard personal data have become so important that corporations collecting vast quantities of personal data have established positions for a **chief privacy officer** (CPO). The CPO is responsible for ensuring that the company complies with existing data privacy laws.

The **chief knowledge officer** (CKO) is responsible for the firm’s knowledge management program. The CKO helps design programs and systems to find new sources of knowledge or to make better use of existing knowledge in organizational and management processes.

**End users** are representatives of departments outside of the information systems group for whom applications are developed. These users are playing an increasingly large role in the design and development of information systems.

In the early years of computing, the information systems group was composed mostly of programmers who performed very highly specialized but limited technical functions. Today, a growing proportion of staff members are systems analysts and network specialists, with the information systems department acting as a powerful change agent in the organization. The information systems department suggests new business strategies and new information-based products and services, and coordinates both the development of the technology and the planned changes in the organization.

INFORMATION SYSTEMS SERVICES

Services provided by the information systems department include the following:

- Computing platforms provide computing services that connect employees, customers, and suppliers into a coherent digital environment, including large mainframes, desktop and laptop computers, servers, and wireless handheld devices.
- Telecommunications services provide data, voice, and video connectivity to employees, customers, and suppliers.
• Data management services store and manage corporate data, and provide capabilities for analyzing the data.
• Application software services provide development and support services for the firm’s business systems, including enterprise-wide capabilities, such as enterprise resource planning, customer relationship management, supply chain management, and knowledge management systems, that are shared by all business units.
• Physical facilities management services develop and manage the physical installations required for computing, telecommunications, and data management services.
• IT management services plan and develop the infrastructure, coordinate with the business units for IT services, manage accounting for the IT expenditure, and provide project management services.
• IT standards services provide the firm and its business units with policies that determine which information technology will be used, when, and how.
• IT educational services provide training in system use to employees and offer managers training in how to plan for and manage IT investments.
• IT research and development services provide the firm with research on potential future information systems projects and investments that could help the firm differentiate itself in the marketplace.

In the past, firms generally built their own software and managed their own computing facilities. Today, many firms are turning to external vendors to provide these services (see Chapters 4 and 11) and are using their information systems departments to manage these service providers.

2.5 Hands-On MIS

The projects in this section give you hands-on experience analyzing a company’s financial and sales data to assess business performance and profitability, using a spreadsheet to improve decision making about suppliers, and using Internet software to plan efficient transportation routes.

ANALYZING FINANCIAL PERFORMANCE

Software skills: Spreadsheet charts and formulas
Business skills: Financial statement analysis

As part of your analysis of the company for management, you have been asked to analyze data on Dirt Bikes’s financial performance. Review Dirt Bikes’s selected financial data in the Introduction to Dirt Bikes, which can be found at the Laudon Web site. There you will find Dirt Bikes’s income statement and summary balance sheet data from 2005 to 2007, annual sales of Dirt Bikes models between 2003 and 2007, and total domestic versus international sales between 2003 and 2007.

<table>
<thead>
<tr>
<th>Model</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enduro 250</td>
<td>1201</td>
<td>1663</td>
<td>2291</td>
<td>2312</td>
<td>2195</td>
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<tr>
<td>Enduro 550</td>
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<td>3290</td>
<td>3759</td>
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<td>Moto 300</td>
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<tr>
<td>Moto 450</td>
<td>463</td>
<td>598</td>
<td>661</td>
<td>773</td>
<td>823</td>
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<td>6251</td>
<td>7483</td>
<td>9165</td>
<td>9778</td>
<td>9292</td>
</tr>
</tbody>
</table>
Use spreadsheet software to create graphs of Dirt Bikes’s sales history from 2003 to 2007 and its domestic versus international sales from 2003 to 2007. Select the type of graph that is most appropriate for presenting the data you are analyzing.

Use the instructions at the Laudon Web site and your spreadsheet software to calculate the gross and net margins in Dirt Bikes’s income statements from 2005 to 2007. You can also create graphs showing trends in selected pieces of Dirt Bikes’s income statement and balance sheet data if you wish. (You may want to rearrange the historical ordering of the data if you decide to do this.)

Prepare an addition to your management report that answers these questions:

• What are Dirt Bikes’s best- and worst-performing products? What is the proportion of domestic to international sales? Have international sales grown relative to domestic sales?
• Are sales (revenues) growing steadily, and, if so, at what rate? What is the cost of goods sold compared to revenues? Is it increasing or decreasing? Are the firm’s gross and net margins increasing or decreasing? Are the firm’s operating expenses increasing or decreasing? Is the firm heavily in debt? Does it have assets to pay for expenses and to finance the development of new products and information systems?
• (Optional) Use electronic presentation software to summarize your analysis of Dirt Bikes’s performance for management.

IMPROVING DECISION MAKING: USE A SPREADSHEET TO SELECT SUPPLIERS

Software skills: Spreadsheet date functions, data filtering, DAVEVERAGE function
Business skills: Analyzing supplier performance and pricing

In this exercise, you will learn how to use spreadsheet software to improve management decisions about selecting suppliers. You will start with raw transactional data about suppliers organized as a large spreadsheet list. You will use the spreadsheet software to filter the data based on several different criteria to select the best suppliers for your company.

You run a company that manufactures aircraft components. You have many competitors who are trying to offer lower prices and better service to customers, and you are trying to determine whether you can benefit from better supply chain management. At the Laudon Web site for Chapter 2, you will find a spreadsheet file that contains a list of all of the items that your firm has ordered from its suppliers during the past three months. The fields in the spreadsheet file include vendor name, vendor identification number, purchaser’s order number, item identification number and item description (for each item ordered from the vendor), cost per item, number of units of the item ordered (quantity), total cost of each order, vendor’s accounts payable terms, order date, and actual arrival date for each order.

Prepare a recommendation of how you can use the data in this spreadsheet database to improve your decisions about selecting suppliers. Some criteria to consider for identifying...
preferred suppliers include the supplier’s track record for on-time deliveries, suppliers offering the best accounts payable terms, and suppliers offering lower pricing when the same item can be provided by multiple suppliers. Use your spreadsheet software to prepare reports to support your recommendations.

ACHIEVING OPERATIONAL EXCELLENCE: USING INTERNET SOFTWARE TO PLAN EFFICIENT TRANSPORTATION ROUTES

In this exercise, you will use the same online software tool that businesses use to map out their transportation routes and select the most efficient route. The MapQuest (www.mapquest.com) Web site includes interactive capabilities for planning a trip. The software on this Web site can calculate the distance between two points and provide itemized driving directions to any location.

You have just started working as a dispatcher for Cross-Country Transport, a new trucking and delivery service based in Cleveland, Ohio. Your first assignment is to plan a delivery of office equipment and furniture from Elkhart, Indiana (at the corner of E. Indiana Ave. and Prairie Street) to Hagerstown, Maryland (corner of Eastern Blvd. N. and Potomac Ave.). To guide your trucker, you need to know the most efficient route between the two cities. Use MapQuest to find the route that is the shortest distance between the two cities. Use MapQuest again to find the route that takes the least time. Compare the results. Which route should Cross-Country use?

LEARNING TRACKS

The following Learning Tracks provide content relevant to topics covered in this chapter:

1. Challenges of Using Business Information Systems
2. Organizing the Information Systems Function

Review Summary

1 What are the major features of a business that are important for understanding the role of information systems? A business is a formal complex organization producing products or services for a profit. Businesses have specialized functions, such as finance and accounting, human resources, manufacturing and production, and sales and marketing. Business organizations are arranged hierarchically into levels of management. A business process is a logically related set of activities that defines how specific business tasks are performed. Business firms must monitor and respond to their surrounding environments.

2 How do information systems support the major business functions: sales and marketing, manufacturing and production, finance and accounting, and human resources? Sales and marketing systems help the firm identify customers for the firm’s products or services, develop products and services to meet customers’ needs, promote the products and services, sell the products and services, and provide ongoing customer support. Manufacturing and production systems deal with the planning, development, and production of products and services, and control the flow of production. Finance and accounting systems keep track of the firm’s financial assets and fund flows. Human resources systems maintain employee records; track employee skills, job performance, and training; and support planning for employee compensation and career development.
3 How do systems serve the various levels of management in a business and how are these systems related? Systems serving operational management are transaction processing systems (TPS), such as payroll or order processing, that track the flow of the daily routine transactions necessary to conduct business. Management information systems (MIS) and decision-support systems (DSS) support middle management. Most MIS reports condense information from TPS and are not highly analytical. DSS support management decisions that are unique and rapidly changing, using advanced analytical models and data analysis capabilities. Executive support systems (ESS) support senior management by providing data that are often in the form of graphs and charts delivered via portals using many sources of internal and external information.

4 How do enterprise applications, collaboration and communication systems, and intranets improve organizational performance? Enterprise applications (enterprise systems, supply chain management systems, customer relationship management systems, and knowledge management systems) are designed to coordinate multiple functions and business processes. Enterprise systems integrate the key internal business processes of a firm into a single software system to improve coordination, efficiency, and decision making. Supply chain management systems help the firm manage its relationship with suppliers to optimize the planning, sourcing, manufacturing, and delivery of products and services. Customer relationship management uses information systems to coordinate all of the business processes surrounding the firm’s interactions with its customers to optimize firm revenue and customer satisfaction. Knowledge management systems enable firms to optimize the creation, sharing, and distribution of knowledge. Jobs where interaction is the primary value-adding activity benefit from collaboration and communication systems. Intranets and extranets use Internet technology and standards to assemble information from disparate systems and present it to the user in a Web page format. Extranets make portions of private corporate intranets available to outsiders.

5 What is the role of the information systems function in a business? The information systems department is the formal organizational unit responsible for information technology services. It is responsible for maintaining the hardware, software, data storage, and networks that comprise the firm’s IT infrastructure. The department consists of specialists, such as programmers, systems analysts, project leaders, and information systems managers, and is often headed by a CIO.

Key Terms

- Business, 41
- Business processes, 43
- Chief information officer (CIO), 68
- Chief knowledge officer (CKO), 68
- Chief privacy officer (CPO), 68
- Chief security officer (CSO), 68
- Customer relationship management (CRM) systems, 62
- Data workers, 45
- Decision-support systems (DSS), 55
- Electronic business (e-business), 67
- Electronic commerce (e-commerce), 67
- E-government, 67
- End users, 68
- Enterprise applications, 59
- Enterprise systems, 59
- Executive support systems (ESS), 57
- Finance and accounting information systems, 50
- Human resources information systems, 51
- Information systems department, 67
- Information systems managers, 68
- Interorganizational system, 61
- Knowledge management systems (KMS), 64
- Knowledge workers, 45
- Management information systems (MIS), 55
- Manufacturing and production information systems, 49
- Middle management, 45
- Operational management, 45
- Portal, 57
- Production or service workers, 45
- Programmers, 68
- Sales and marketing information systems, 48
- Senior management, 45
- Supply chain management (SCM) systems, 61
- Systems analysts, 68
- Transaction processing systems (TPS), 54
Review Questions

1. What are the major features of a business that are important for understanding the role of information systems?
   • Define a business and describe the major business functions.
   • Define business processes and describe the role they play in organizations.
   • Identify and describe the different levels in a business firm and their information needs.
   • Explain why environments are important for understanding a business.

2. How do information systems support the major business functions: sales and marketing, manufacturing and production, finance and accounting, and human resources?
   • List and describe the information systems serving each of the major functional areas of a business.

3. How do systems serve the various levels of management in a business and how are these systems related?
   • Describe the characteristics of transaction processing systems (TPS) and role they play in a business.
   • Describe the characteristics of MIS and explain how MIS differ from TPS and from DSS.
   • Describe the characteristics of DSS and explain how DSS differ from ESS.
   • Describe the relationship between TPS, MIS, DSS, and ESS.

4. How do enterprise applications, collaboration and communication systems, and intranets improve organizational performance?
   • Explain how enterprise applications improve organizational performance.
   • Define enterprise systems and describe how they change the way an organization works.
   • Define supply chain management systems and describe how they benefit businesses.
   • Define customer relationship management systems and describe how they benefit businesses.
   • Describe the role of knowledge management systems in the enterprise.
   • List and describe the various types of collaboration and communication systems.
   • Explain how intranets and extranets help firms integrate information and business processes.

5. What is the role of the information systems function in a business?
   • Describe how the information systems function supports a business.
   • Compare the roles played by programmers, systems analysts, information systems managers, the chief information officer (CIO), chief security officer (CSO), and chief knowledge officer (CKO).

Discussion Questions

1. How could information systems be used to support the order fulfillment process illustrated in Figure 2-2? What are the most important pieces of information these systems should capture? Explain your answer.

2. Adopting an enterprise application is a key business decision as well as a technology decision. Do you agree? Why or why not? Who should make this decision?
Video Case

You will find a video case illustrating some of the concepts in this chapter on the Laudon Web site along with questions to help you analyze the case.

Teamwork

Describing Management Decisions and Systems

With a group of three or four other students, find a description of a manager in a corporation in Business Week, Forbes, Fortune, or another business magazine. Write a description of the kinds of decisions this manager has to make and the kind of information that manager would need for those decisions. Suggest how information systems could supply this information. If possible, use presentation software to present your findings to the class.

BUSINESS PROBLEM-SOLVING CASE

JetBlue Hits Turbulence

In February 2000, JetBlue started flying daily to Fort Lauderdale, Florida and Buffalo, New York, promising top-notch customer service at budget prices. The airline featured new Airbus A320 planes with leather seats, each equipped with a personal TV screen, and average one-way fares of only $99 per passenger.

JetBlue was able to provide this relatively luxurious flying experience by using information systems to automate key processes, such as ticket sales (online sales dominate) and baggage handling (electronic tags help track luggage). JetBlue prided itself on its “paperless processes.”

JetBlue’s investment in information technology enabled the airline to turn a profit by running its business at 70 percent of the cost of larger competitors. At the same time, JetBlue filled a higher percentage of its seats, employed non-union workers, and established enough good will to score an impressive customer retention rate of 50 percent.

Initially, JetBlue flew only one type of plane from one vendor: the Airbus A320. This approach enabled the airline to standardize flight operations and maintenance procedures to a degree that resulted in considerable savings. CIO Jeff Cohen used the same simple-is-better strategy for JetBlue’s information systems.

Cohen depended almost exclusively on Microsoft software products to design JetBlue’s extensive network of information systems. (JetBlue’s reservation system and systems for managing planes, crews, and scheduling are run by an outside contractor.) Using a single vendor provided a technology framework in which Cohen could keep a small staff and favor in-house development of systems over outsourcing and relying on consultants.

The benefit was stable and focused technology spending. JetBlue spent only 1.5 percent of its revenue on information technology, as opposed to the 5 percent spent by competitors.

JetBlue’s technology strategy helped create a pleasing flying experience for passengers. As president and chief operating officer Dave Barger put it, “Some people say airlines are powered by fuel, but this airline is powered by its IT infrastructure.” JetBlue consistently found itself at the top of J.D. Power and Associates customer satisfaction surveys. JetBlue believed it had learned to work lean and smart.

The big question was whether JetBlue would be able to maintain its strategy and its success as the airline grew. By the end of 2006, the company was operating 500 flights daily in 50 cities and had $2.4 billion in annual revenue. Along the way, JetBlue committed to purchasing a new plane every five weeks through 2007, at a cost of $52 million each. Through all of this, JetBlue remained true to its formula for success and customers continued to return.

February 14, 2007, was a wake-up call. A fierce ice storm struck the New York City area that day and set in motion a string of events that threatened JetBlue’s sterling reputation and its stellar customer relationships. JetBlue made a fateful decision to maintain its schedule in the belief that the horrible weather would break. JetBlue typically avoided pre-canceling flights because passengers usually preferred to have a delayed arrival.
than to camp out at a terminal or check into a hotel. If the airline had guessed correctly, it would have kept its revenue streams intact and made the customers who were scheduled to fly that day very happy. Most other airlines began canceling flights early in the day, believing it was the prudent decision even though passengers would be inconvenienced and money would be lost.

The other airlines were correct. Nine JetBlue planes left their gates at John F. Kennedy International Airport and were stranded on the tarmac for at least six hours. The planes were frozen in place or trapped by iced-over access roads, as was the equipment that would de-ice or move the aircraft. Passengers were confined inside the planes for up to ten and one-half hours. Supplies of food and water on the planes ran low and toilets in the restrooms began to back up. JetBlue found itself in the middle of a massive dual crisis of customer and public relations.

JetBlue waited too long to solicit help for the stranded passengers because the airline figured that the planes would be able to take off eventually. Meanwhile, the weather conditions and the delays or cancellations of other flights caused customers to flood JetBlue’s reservations system, which could not handle the onslaught. At the same time, many of the airline’s pilots and flight crews were also stranded and unable to get to locations where they could pick up the slack for crews that had just worked their maximum hours without rest, but did not actually go anywhere. Moreover, JetBlue did not have a system in place for the rested crews to call in and have their assignments rerouted.

The glut of planes and displaced or tired crews forced JetBlue to cancel more flights the next day, a Thursday. And the cancellations continued daily for nearly a week, with the Presidents’ Day holiday week providing few opportunities for rebooking. On the sixth day, JetBlue cancelled 139 of 600 flights involving 11 other airports.

JetBlue’s eventual recovery was of little solace to passengers who were stranded at the airport for days and missed reservations for family vacations. Overall, more than 1,100 flights were cancelled, and JetBlue lost $30 million. The airline industry is marked by low profit margins and high fixed costs, which means that even short revenue droughts, such as a four-day shutdown, can have devastating consequences for a carrier’s financial stability.

Throughout the debacle, JetBlue’s CEO David G. Neeleman was very visible and forthcoming with accountability and apologies. He was quoted many times, saying things such as, “We love our customers and we’re horrified by this. There’s going to be a lot of apologies.”

Neeleman also admitted to the press that JetBlue’s management was not strong enough and its communications system was inadequate. The department responsible for allocating pilots and crews to flights was too small. Some flight attendants were unable to get in touch with anyone who could tell them what to do for three days. With the breakdown in communications, thousands of pilots and flight attendants were out of position, and the staff could neither find them nor tell them where to go.

JetBlue had grown too fast, and its low-cost IT infrastructure and systems could not keep up with the business. JetBlue was accustomed to saving money both from streamlined information systems and lean staffing. Under normal circumstances, the lean staff was sufficient to handle all operations, and the computer systems functioned well below their capacity. However, the ice storm exposed the fragility of the infrastructure as tasks such as rebooking passengers, handling baggage, and locating crew members became impossible.

Although Neeleman asserted in a conference call that JetBlue’s computer systems were not to blame for its meltdown, critics of the company pointed out that JetBlue lacked systems to keep track of off-duty flight crews and lost baggage. Its reservation system could not expand enough to meet the high customer call volume. Navitaire, headquartered in Minneapolis, hosts the reservation system for JetBlue as well as for a dozen other discount airlines. The Navitaire system was configured to accommodate up to 650 agents at one time, which was more than sufficient under normal circumstances. During the Valentine’s Day crisis, Navitaire was able to tweak the system to accommodate up to 950 agents simultaneously, but that was still not enough.

Moreover, JetBlue could not find enough qualified employees to staff its phones. The company employs about 1,500 reservation agents who work primarily from their homes, linking to its Navitaire Open Skies reservation system using an Internet-based voice communications system. Many ticketholders were unable to determine the status of their flights because the phone lines were jammed. Some callers received a recording that directed them to JetBlue’s Web site. The Web site stopped responding because it could not handle the spike in visitors, leaving many passengers with no way of knowing whether they should make the trip to the airport.

JetBlue lacked a computerized system for recording and tracking lost bags. It did have a system for storing information such as the number of bags checked in by a passenger and bag tag identification numbers. But the system could not record which bags had not been picked up or their location. There was no way for a JetBlue agent to use a computer to see if a lost bag for a particular passenger was among the heap of unclaimed bags at airports where JetBlue was stranded. In the past,
JetBlue management did not feel there was a need for such a system because airport personnel were able to look up passenger records and figure out who owned leftover bags. When so many flights were canceled, the process became unmanageable.

JetBlue uses several applications provided by outsourcing vendor Sabre Airline Solutions of Southlake, Texas to manage, schedule, and track planes and crews and to develop actual flight plans. Sabre’s FliteTrac application interfaces with the Navitaire reservation system to provide managers with information about flight status, fuel, passenger lists, and arrival times. Sabre’s CrewTrac application tracks crew assignments and provides pilots and flight attendants access to their schedules via a secure Web portal. JetBlue uses a Navitaire application called SkySolver to determine how to redeploy planes and crews to emerge from flight disruptions. However, JetBlue found out during the Valentine’s Day emergency that SkySolver was unable to transfer the information quickly to JetBlue’s Sabre applications. And even if these systems had worked properly together, JetBlue would have probably been unable to locate all of its flight crews to redirect them. It did not have a system to keep track of off-duty crew members. Overtaxed phone lines prevented crew members from calling into headquarters to give their locations and availability for work.

JetBlue’s response to its humiliating experience was multifaceted. On the technology front, the airline deployed new software that sends recorded messages to pilots and flight attendants to inquire about their availability. When the employees return the calls, the information they supply is entered into a system that stores the data for access and analysis. From a staffing standpoint, Neeleman promised to train 100 employees from the airline’s corporate office to serve as backups for the departments that were stretched too thin by the effects of the storm.

JetBlue attempted to address its customer relations and image problems by creating a customer bill of rights to enforce standards for customer treatment and airline behavior. JetBlue would be penalized when it failed to provide proper service, and customers who were subjected to poor service would be rewarded. JetBlue set the maximum time for holding passengers on a delayed plane at five hours. The company changed its operational philosophy to make more accommodation for inclement weather.

An opportunity to test its changes arrived for JetBlue just one month after the incident that spurred the changes. Faced with another snow and ice storm in the northeast United States on March 16, 2007, JetBlue cancelled 215 flights, or about a third of its total daily slate. By canceling early, management hoped to ensure that its flight crews would be accessible and available when needed, and that airport gates would be kept clear in case flights that were already airborne had to return.

In the wake of its winter struggles, JetBlue was left to hope that its customers would be forgiving and that its losses could be offset. Neeleman pointed out that only about 10,000 of JetBlue’s 30 million annual customers were inconvenienced by the airline’s weather-related breakdowns. On May 10, 2007, JetBlue’s Board of Directors removed Neeleman as CEO, placing him in the role of non-executive chairman. According to Liz Roche, managing partner at Customers Incorporated, a customer relationship management research and consulting firm, “JetBlue demonstrated that it’s an adolescent in the airline industry and that it has a lot of learning and growing up to do.”


Case Study Questions
1. What types of information systems and business functions are described in this case?
2. What is JetBlue’s business model? How do its information systems support this business model?
3. What was the problem experienced by JetBlue in this case? What people, organization, and technology factors were responsible for the problem?
4. Evaluate JetBlue’s response to the crisis. What solutions did the airline come up with? How were these solutions implemented? Do you think that JetBlue found the correct solutions and implemented them correctly? What other solutions can you think of that JetBlue hasn’t tried?
5. How well is JetBlue prepared for the future? Are the problems described in this case likely to be repeated? Which of JetBlue’s business processes are most vulnerable to breakdowns? How much will a customer bill of rights help?