Chapter 2

Global E-business and Collaboration

LEARNING OBJECTIVES

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

1. What are business processes? How are they related to information systems?
2. How do systems serve the different management groups in a business?
3. How do systems that link the enterprise improve organizational performance?
4. Why are systems for collaboration and social business so important and what technologies do they use?
5. What is the role of the information systems function in a business?

Interactive Sessions:

Schiphol International Hub

Piloting Procter & Gamble from Decision Cockpits

CHAPTER OUTLINE

TELUS EMBRACES SOCIAL LEARNING

TELUS is a Canadian telecommunications company that has been around for a century, and it wants to ensure that every Canadian is connected to the rest of the world, whether that connection is through wireless devices, the Internet, television, or traditional telephone lines. The company has 12.7 million customer accounts.

Providing superior service is an important corporate goal. Management believes that good teamwork and employee learning are vital for achieving this goal. Until recently, most employee learning at TELUS took place in formal classroom settings outside the company. Much of what employees learned depended on knowledge presented by instructors, and this learning method was expensive. Employees would be better off learning from each other's expertise, management concluded. Moreover, 40 percent of the TELUS workforce was expected to retire within the next 10 years, making it essential for the company to find multiple ways of sharing and preserving employee experience and knowledge.

The company decided to focus on making team member education more "continuous, collaborative, and connected" through informal and social learning, using mentoring, coaching, job rotations, videos, blogs, and wikis. TELUS set a 2010 learning budget of $21 million, 40 percent of which was for informal and social learning and 60 percent for formal learning. (The year before, formal learning had accounted for 90 percent of the firm's $28.5 million learning budget.)

To support the new learning initiative, TELUS harnessed the capabilities of Microsoft SharePoint Server 2010, which provides team members with a single point of entry to shared knowledge within the company and the ability to search all the company's learning assets simultaneously. TELUS used the SharePoint MySites feature to enable team members to create their own Web pages that describe their areas of expertise and special skills. Team members are able to see their positions and those of others in the organizational hierarchy, connect with colleagues, and establish informal groups with other people with similar skills. An Expert Search capability provides ranked search results identifying TELUS employees with expertise in specific areas. MySites also offers blogging tools for team members to build their own blogs and contribute to those of others. Through these blogs, a team member can locate an expert, discuss his or her experiences, share advice, and find the answers to questions without having to take a class or interrupt a colleague.

TELUS used SharePoint to develop team sites called My Communities, where project teams, departments, and other groups can work together and share documents and other content. They are able to create categories for classifying and tagging user-generated content. TELUS Tube allows team members to post and view user-generated video of their accomplishments on the job or questions to ask colleagues. Over 1,000 videos have been posted. A new learning management system working closely with SharePoint Server 2010 enables team members to track and display the formal learning courses they have taken as well as the courses other team members have taken.

TELUS recognized that moving from formal learning to acquiring knowledge through employee collaboration and participation required a shift in company culture. "This is not a scenario in which we can flip a switch and have everyone change their work habits overnight," observed Dan Pontefract, Senior Director of Learning for TELUS. To encourage acceptance of and participation in the new social learning processes, the company set up an internal site showing tangible examples of the new collaboration tools and launched a wiki to facilitate employee discussion. Pontefract includes information about the new learning initiative on his blog to help prepare team members for the shift.

The new SharePoint system gives TELUS team members much faster access to the specific skills and knowledge areas where they need help—they don't need to wait for the next formal learning class. Instead, team members can immediately reach out to colleagues who have expertise in a specific area, or they can read wikis and blogs, watch videos, and participate in discussions to find answers.

Implementing SharePoint reduced the TELUS learning budget to $21 million in 2010. The company was able to trim this budget by 20 percent the following year as it continued its shift to informal and social learning. Further cost savings will occur as the new learning solutions take hold. In the TELUS three-year plan, formal learning will comprise just 50 percent of the total learning budget.

Sources: Sharon Gaudin, "Telus Links Social, Traditional Training," *Computerworld*, March 27, 2012; "TELUS Telecom Company Embraces Social Computing, Streamlines Formal Learning," www.microsoft.com, accessed April 5, 2012; Barb Mosher, "Sharepoint 2010 Case Study: Informal and Social Learning at TELUS," *CMSWire*, June 30, 2010, and www.telus.com, accessed April 6, 2012.

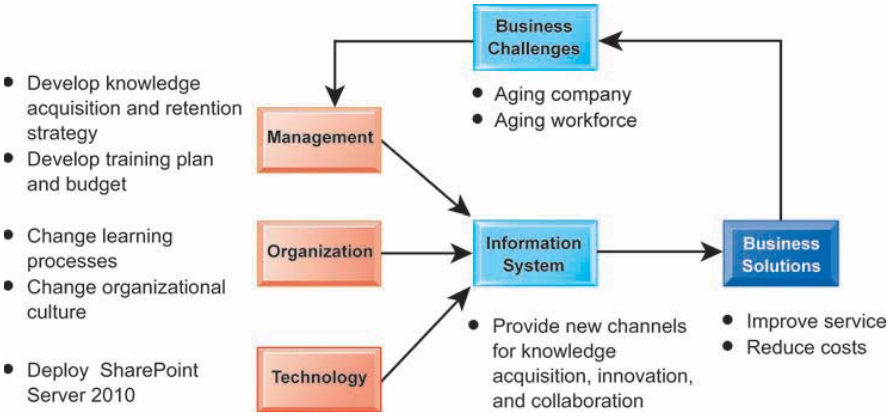
The experience of TELUS illustrates how much organizations today rely on information systems to improve their performance and remain competitive. It also shows how much systems supporting collaboration and teamwork make a difference in an organization's ability to execute, provide superior customer service, and grow profits.

The chapter-opening diagram calls attention to important points raised by this case and this chapter. TELUS is an "old" company that wanted to continue changing with the times and remain customer-focused. It also needed to find a way to capture and preserve employee knowledge and expertise as 40 percent of its workforce neared retirement age.

TELUS management decided that the best solution was to deploy new technology to move from a formal learning environment to one in which team members contributed to and obtained knowledge from colleagues. The company implemented Microsoft SharePoint Server 2010 as a company-wide platform for collaboration, knowledge acquisition, and knowledge transfer, and it took advantage of the software's new "social" tools to facilitate employee collaboration and engagement. TELUS now relies on its internal enterprise social network for much of employee learning and problem-solving, and SharePoint integrates all of the ways employees learn and share knowledge—formal training classes, podcasts, blogs, wikis, videos, and corporate social networking. The company more effectively shares institutional knowledge and has reduced its costs.

New technology alone would not have solved TELUS's problem. To make the solution effective, TELUS had to change its organizational culture and business processes for knowledge dissemination and employee learning.

Here are some questions to think about: How are collaboration and employee learning keeping TELUS competitive? What are the benefits of each of the collaboration and social tools discussed in this case?



2.1 Business Processes and Information Systems

In order to operate, businesses must deal with many different pieces of information about suppliers, customers, employees, invoices, and payments, and of course their products and services. They must organize work activities that use this information to operate efficiently and enhance the overall performance of the firm. Information systems make it possible for firms to manage all their information, make better decisions, and improve the execution of their business processes.

BUSINESS PROCESSES

Business processes, which we introduced in Chapter 1, refer to the manner in which work is organized, coordinated, and focused to produce a valuable product or service. Business processes are the collection of activities required to produce a product or service. These activities are supported by flows of material, information, and knowledge among the participants in business processes. Business processes also refer to the unique ways in which organizations coordinate work, information, and knowledge, and the ways in which management chooses to coordinate work.

To a large extent, the performance of a business firm depends on how well its business processes are designed and coordinated. A company's business processes can be a source of competitive strength if they enable the company to innovate or to execute better than its rivals. Business processes can also be liabilities if they are based on outdated ways of working that impede organizational responsiveness and efficiency. The chapter-opening case describing TELUS's improvements in employee learning processes clearly illustrates these points, as do many of the other cases in this text.

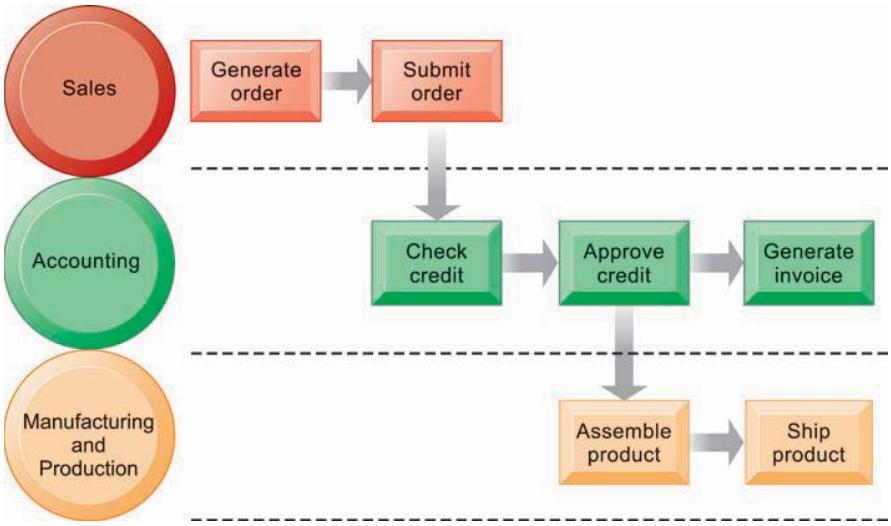
Every business can be seen as a collection of business processes, some of which are part of larger encompassing processes. For instance, uses of mentoring, wikis, blogs, and videos are all part of the overall knowledge management process. Many business processes are tied to a specific functional area. For example, the sales and marketing function is responsible for identifying customers, and the human resources function is responsible for hiring employees. Table 2.1 describes some typical business processes for each of the functional areas of business.

TABLE 2.1 EXAMPLES OF FUNCTIONAL BUSINESS PROCESSES

FUNCTIONAL AREA	BUSINESS PROCESS
Manufacturing and production	Assembling the product Checking for quality Producing bills of materials
Sales and marketing	Identifying customers Making customers aware of the product Selling the product
Finance and accounting	Paying creditors Creating financial statements Managing cash accounts
Human resources	Hiring employees Evaluating employees' job performance Enrolling employees in benefits plans

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 2.1). Initially, the sales department receives a sales order. The order passes 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 pulls the product from inventory or produces the product. Then the product is shipped (and this may require working with a logistics firm, such as UPS or FedEx). A bill or invoice is generated by the accounting department, and a notice is sent to the customer indicating that the product has shipped. The sales department is notified of the shipment and prepares to support the customer by answering calls or fulfilling warranty claims.

FIGURE 2.1 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 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. Moreover, to efficiently perform all these steps in the order fulfillment process requires a great deal of information. The required information must flow rapidly both within the firm from one decision maker to another; with business partners, such as delivery firms; and with the customer. Computer-based information systems make this possible.

HOW INFORMATION TECHNOLOGY IMPROVES BUSINESS PROCESSES

Exactly how do information systems improve business processes? Information systems automate many steps in business processes that were formerly performed manually, such as checking a client's credit, or generating an invoice and shipping order. But today, information technology can do much more. New technology can actually change the flow of information, making it possible for many more people to access and share information, replacing sequential steps with tasks that can be performed simultaneously, and eliminating delays in decision making. New information technology frequently changes the way a business works and supports entirely new business models. Downloading a Kindle e-book from Amazon, buying a computer online at Best Buy, and downloading a music track from iTunes are entirely new business processes based on new business models that would be inconceivable without today's information technology.

That's why it's so important to pay close attention to business processes, both in your information systems course and in your future career. By analyzing business processes, you can achieve a very clear understanding of how a business actually works. Moreover, by conducting a business process analysis, you will also begin to understand how to change the business by improving its processes to make it more efficient or effective. Throughout this book, we examine business processes with a view to understanding how they might be improved by using information technology to achieve greater efficiency, innovation, and customer service.

2.2 Types of Information Systems

Now that you understand business processes, it is time to look more closely at how information systems support the business processes of a firm. 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.

A typical business organization has systems supporting processes for each of the major business functions—sales and marketing, manufacturing and production, finance and accounting, and human resources. You can find examples of systems for each of these business functions in the Learning Tracks for this chapter. Functional systems that operate independently of each other are becoming a thing of the past because they cannot easily share information to support cross-functional business processes. Many have been replaced with large-scale cross-functional systems that integrate the activities of related business processes and organizational units. We describe these integrated cross-functional applications later in this section.

A typical firm also has different systems supporting the decision-making needs of each of the main management groups we described in Chapter 1. Operational management, middle management, and senior management each use systems to support the decisions they must make to run the company. Let's look at these systems and the types of decisions they support.

SYSTEMS FOR DIFFERENT MANAGEMENT GROUPS

A business firm has systems to support different groups or levels of management. These systems include transaction processing systems and systems for business intelligence.

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. Smith's payment? To answer these kinds of questions, information generally must be easily available, current, and accurate.

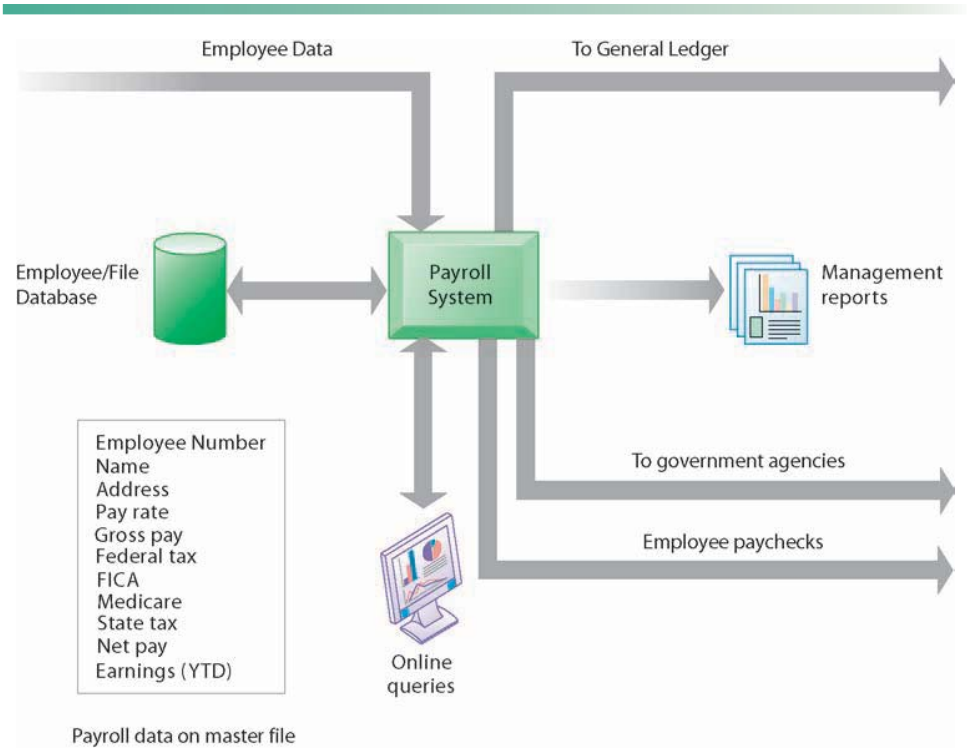
At the operational level, tasks, resources, and goals are predefined and highly structured. The decision to grant credit to a customer, for instance, is made by a lower-level supervisor according to predefined criteria. All that must be determined is whether the customer meets the criteria.

Figure 2.2 illustrates a TPS for payroll processing. A payroll system keeps track of money paid to employees. An employee time sheet with the employee's name, social security number, and number of hours worked per week represents a single transaction for this system. Once this transaction is input into the system, it updates the system's master file (or database—see Chapter 6) that permanently maintains employee information for the organization. The data in the system are combined in different ways to create reports of interest to management and government agencies and to send paychecks to employees.

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 systems and business functions. For example, the payroll system illustrated in Figure 2.2, 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. It also supplies employee payment history data for insurance, pension, and other benefits calculations to the firm's human resources function, and employee payment data to government agencies such as the U.S. Internal Revenue Service and Social Security Administration.

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?

FIGURE 2.2 A PAYROLL TPS



A TPS for payroll processing captures employee payment transaction data (such as a time card). System outputs include online and hard-copy reports for management and employee paychecks.

The Interactive Session on Technology describes the impact on airline travel when automated baggage handling systems are not working properly. As you read this case, try to identify the transactions being processed and how the data generated from these systems impact business performance.

Systems for Business Intelligence

Firms also have business intelligence systems that focus on delivering information to support management decision making. **Business intelligence** is a contemporary term for data and software tools for organizing, analyzing, and providing access to data to help managers and other enterprise users make more informed decisions. Business intelligence addresses the decision-making needs of all levels of management. This section provides a brief introduction to business intelligence. You'll learn more about this topic in Chapters 6 and 12.

Business intelligence systems for middle management help with monitoring, controlling, decision-making, and administrative activities. 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

INTERACTIVE SESSION: TECHNOLOGY

SCHIPHOL INTERNATIONAL HUB

Theoretically, baggage-handling is quite simple. Baggage input is connected to merely two events: an airplane lands or a person checks in. However, it's risky business. Baggage handling is the second most important factor in having a pleasant trip, according to a 2009 IATA CATS survey. Moreover, mishandled baggage is a $2.5 billion problem for industry every year. Just think that this problem may annually affect about 51 million passengers travelling through Schiphol airport alone.

In 2004, IBM Corporation,Vanderlande Industries and later Grenzebach Automation Systems, jointly took up the challenge of renewing the Baggage Control System for one of the biggest airport hubs in Europe, and one of the busiest in the world: Schiphol International Airport, in Amsterdam, the Netherlands. With an investment of around $1 billion over a period of about 10 years, Schiphol's goal was threefold: (a) realize a monumental 1% maximum loss of transfer baggage (against the initial 22 million lost baggage); (b) increase capacity from 40 to 70 million bags; (c) reduce cost per bag without increasing wait-times.

Most of the job involved Schiphol's gigantic baggage conveyor network: 21 kilometers of transport tracks, 6 robotic units, and 9,000 storage capacitors, all behaving as one system. Also, extending the system with more surfaces is not possible, given the land conditions surrounding the airport. The baggage conveyor network has a simple goal: the right bag must be at the right place at the right time. To pursue this goal the network must perform several key roles: move bags from the check-in area to the departure gate, move bags from gate to gate, move bags from the arrival gate to the baggage claim, and plan and control peripheral hardware and software. In addition, these roles involve a wide variety of sensors, actuators, mechanical devices, and computers. The network uses over 3 million lines of source code. Some of the advanced technology used in baggage- handling systems includes destination-coded vehicles (DCVs), automatic bar code scanners, radio-frequency identification (RFID) tags, and high- tech conveyors equipped with sorting machines. Baggage should move from its current location to its destination before travellers do. To add further complications, all of this must be available and robust, i.e. operate 99.99% of times while being able to minimize loss or damage in that 0.01% of time it doesn't!

The following simple scenario summarizes the operations of the Schiphol baggage conveyors network. You arrive at check-in desk, and your bags are tagged. The tags contain your flight information and a bar-code/RFID that all of the computers in the baggage-handling system can read. When computers in the system scan the bar code/detect the RFID, they process the information it contains and determine where to send your bag. After being scanned (at least) once, the system always knows where your bag is at any point, and is able to redirect it based on three parameters: (a) time of its flight; (b) priority; (c) size. Bags for immediate embarkation are considered "hot". These are sent immediately to aircraft stands while "cold" baggage (i.e. low priority, distant flight time) are quickly rerouted away from the main "highway" tracks, directed towards various storage points in the network. DCVs are unmanned carts that can load and unload bags without stopping movement. These carts move on tracks like miniature roller coasters along the main "highway" tracks that span the airport. Buffers and hot/cold storage areas are used to avoid overcrowding. Computers throughout the system keep track of the location of each bag, its destination, and the time it is needed at that destination. The system can optimize the routes taken by the carts to get the bags needed most urgently to their destinations fastest. Because DCVs move at high speed and do not come to a full stop to receive baggage, the conveyors must be extremely precise, depositing bags where they are needed at just the right time for maximum efficiency. Once bags reach the gate, they enter a sorting station where airline employees use computer terminals to send bags to the correct plane. To make sure that baggage is not lost, the system "reconciles" baggage with its owner, i.e. it checks if the baggage and the owner are actually on the same plane!

However beautiful and harmonious this process may seem, there are still many things that can go wrong. For example, what if baggage is mis-tagged? What if the tag is unreadable? What about schedule changes?

Baggage handling systems can be extremely expensive, but if implemented successfully, they pay for

themselves — imagine saving around 0.1% of $2.5 billion. It's a lot of money!

The new baggage system at Schiphol is not flawless. In November 2012, a special warrant by local Police was issued that required stopping the tracks at Schiphol as part of a drug-smuggling investigation. Some of the 140,000 passengers that were being served by the international Hub at the time suffered baggage loss.

Sources: Based on data available online. Partly acquired from Amsterdam Airport Schiphol Case Study Video, available online.

CASE STUDY QUESTIONS

1. How many levels of complexity can you identify in Schiphol's baggage conveyor network?
2. What are the management, organization, and technology components of Schiphol's baggage conveyor network?
3. What is the problem that Schiphol is trying to solve? Discuss the business impact of this problem.
4. Think of the data that the network uses. What kinds of management reports can be generated from that data?

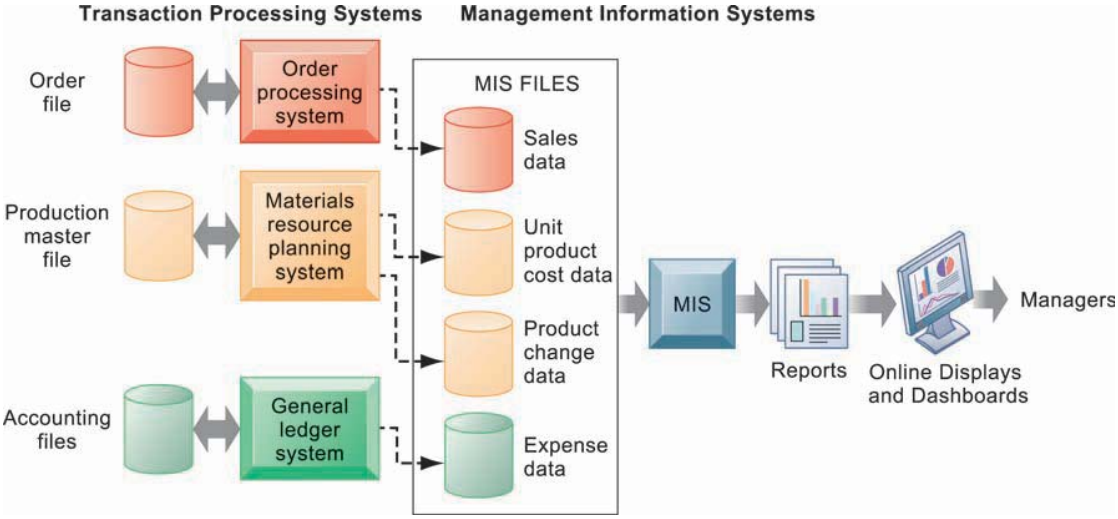
Case contributed by Damian A. Tamburri and Patricia Lago, VU University Amsterdam

schedule. Today, many of these reports are delivered online. Figure 2.3 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 2.4 shows a sample report from this system.

MIS typically 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 2.4, 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.

Other types of business intelligence systems support more non-routine decision making. **Decision-support systems (DSS)** 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

FIGURE 2.3 HOW MANAGEMENT INFORMATION SYSTEMS OBTAIN THEIR DATA FROM THE ORGANIZATION'S TPS



In the system illustrated by this diagram, three TPS supply summarized transaction data to the MIS reporting system at the end of the time period. Managers gain access to the organizational data through the MIS, which provides them with the appropriate reports.

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 are employed by "super-user" managers and business analysts who want to use sophisticated analytics and models to analyze data.

FIGURE 2.4 SAMPLE MIS REPORT

Consolidated Consumer Products Corporation Sales by Product and Sales Region: 2013

PRODUCT CODE	PRODUCT DESCRIPTION	SALES REGION	ACTUAL SALES	PLANNED	ACTUAL versus PLANNED
4469	Carpet Cleaner	Northeast	4,066,700	4,800,000	0.85
		South	3,778,112	3,750,000	1.01
		Midwest	4,867,001	4,600,000	1.06
		West	4,003,440	4,400,000	0.91
	TOTAL		16,715,253	17,550,000	0.95
5674	Room Freshener	Northeast	3,676,700	3,900,000	0.94
		South	5,608,112	4,700,000	1.19
		Midwest	4,711,001	4,200,000	1.12
		West	4,563,440	4,900,000	0.93
	TOTAL		18,559,253	17,700,000	1.05

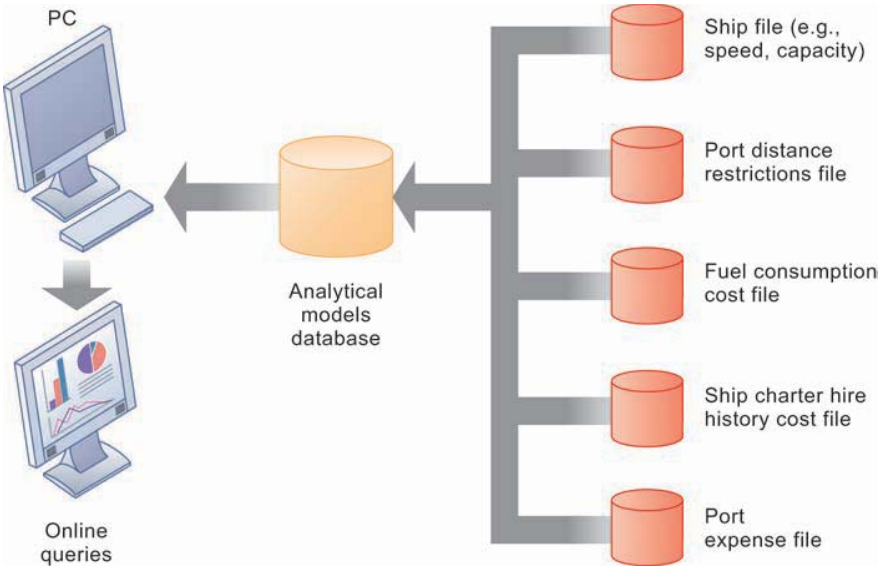
This report, showing summarized annual sales data, was produced by the MIS in Figure 2.3.

An interesting, small, but powerful DSS is the voyage-estimating system of a large global shipping company that transports bulk cargoes of coal, oil, ores, and finished products. 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 2.5 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.

The voyage-estimating DSS we have just described draws heavily on models. Other business intelligence systems are more data-driven, focusing instead on extracting useful information from massive quantities of data. For example, Intrawest—the largest ski operator in North America—collects and stores large 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 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.

FIGURE 2.5 VOYAGE-ESTIMATING DECISION-SUPPORT SYSTEM



This DSS operates on a powerful PC. It is used daily by managers who must develop bids on shipping contracts.

Business intelligence systems also address the decision-making needs of senior management. Senior managers need systems that focus on strategic issues and long-term trends, both in the firm and in the external environment. They are concerned with questions such as: What will employment levels be in five years? What are the long-term industry cost trends? What products should we be making in five years?

Executive support systems (ESS) help senior management make these decisions. They address non-routine decisions requiring judgment, evaluation, and insight because there is no agreed-on procedure for arriving at a solution. 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.

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. Increasingly, such systems include business intelligence analytics for analyzing trends, forecasting, and "drilling down" to data at greater levels of detail.

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. The information is presented in the form of a **digital dashboard**, which displays on a single screen graphs and charts of key performance indicators for managing a company. Digital dashboards are becoming an increasingly popular tool for management decision makers.

A digital dashboard delivers comprehensive and accurate information for decision making often using a single screen. The graphical overview of key performance indicators helps managers quickly spot areas that need attention.

Contemporary business intelligence and analytics technology have promoted data-driven management, where decision makers rely heavily on analytical tools and data at their fingertips to guide their work. Data captured at the factory or sales floor level are immediately available for high-level or detailed views in executive dashboards and reports. It's real-time management. The Interactive Session on Management illustrates information-driven management at work in Procter & Gamble (P&G), a world-class corporation.

SYSTEMS FOR LINKING 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 all these different systems can share information and how managers and employees are able to coordinate their work. In fact, these are all important questions for businesses today.

Enterprise Applications

Getting all the different kinds of systems in a company to work together has proven 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 2.6 on page 86 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 Firms use **enterprise systems**, also known as enterprise resource planning (ERP) systems, to integrate business processes in manufacturing and production, finance and accounting, sales and marketing, and human resources into a single software system. Information that was previously fragmented in many different systems is stored in a single comprehensive data repository where it can be used by many different parts of the business.

For example, when a customer places an order, the order 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 been depleted. The accounting department is notified to send the

INTERACTIVE SESSION: MANAGEMENT

PILOTING PROCTER & GAMBLE FROM DECISION COCKPITS

Procter & Gamble (P&G) is one of the biggest consumer goods companies in the world, with 127,000 employees across 180 countries, 300 brands, and $82 billion in revenues in 2011. P&G is regularly ranked near the top of lists of "most admired companies" for its ability to create, market, and sell major consumer product brands. A major reason for P&G's success has been its robust information technology and willingness to pursue new IT innovations to maintain a competitive advantage in its industry.

To that end, P&G has made it its goal to digitize its processes from end to end and to fundamentally change the way it gathers, reports, and interprets data. While P&G is trimming costs from other areas of the business, its Global Business Services division is building analytics expertise and undertaking new analytical solutions such as Business Sufficiency, Business Sphere, and Decision Cockpits.

These solutions eliminate time spent debating different data sets, and instead use a system that allows leaders to focus on immediate business decisions using the most accurate data available at that precise moment.

The solutions are based on a transformation in the way P&G uses data for decision making across the company, from executives, to brand managers, to lower-level employees. P&G's old decision-making model was to figure out what reports people wanted, capture the data, and then deliver them to the key decision makers days or weeks later. The new model is more instantaneous, with people huddling together in person or via video and pulling in the right experts to fix a problem the moment it arises. More real-time data and analytics expertise are required.

The Business Sufficiency program, launched in 2010, furnishes executives with predictions about P&G market share and other key performance metrics six months to one year into the future. It is based on a series of analytic models showing what's occurring in the business right now (shipments, sales, market share), why it's happening, and what actions P&G can take. The "why" models highlight sales data at the country, territory, product line, and store levels, along with drivers such as advertising and consumer consumption, factoring in specific economic data at the regional and country levels. The "actions" show ways that P&G can adjust pricing, advertising, and product mix to respond to the predictions.

For example, when CEO Bob McDonald meets with his executive committee each Monday, they examine the top categories of products and country markets (such as Italy and hair care) that are responsible for 60 percent of sales. Data visualizations show changes in sales and market share. Executives may want more detailed data: Is the sales dip in detergent in Germany because of one large retailer? Is that retailer buying less only in Germany or across Europe? Did a rival take away market share because P&G raised prices or cut promotions, or is the product category overall losing sales?

P&G's Business Sphere is an interactive system designed to reveal insights, trends, and opportunities for P&G's leaders and prompt them to ask focused business questions that can be addressed with data on the spot. Two giant 32-foot by 8-foot concave display screens physically surround these managers with the data on sales, market share, and ad spending required to make actionable decisions. Thousands of algorithms and analytical models aggregate data, organizing it by country, territory, product line, store level, and other categories, and monitor trends like response to advertising and consumer consumption within individual regions and countries. Everyone in the meeting sees the same information.

The program analyzes 200 terabytes of P&G data, equivalent to 200,000 copies of the Encyclopedia Britannica, and displays information quickly and clearly. The Business Sphere allows top executives to answer their own specific business questions, and to visualize data in a more intuitive way than a simple report allows. The Business Sphere was envisioned as a kind of command center, where top managers gather either in person or via high-quality videoconferencing technology like Cisco TelePresence, and immediately determine the biggest problems facing the business and who can fix those problems as soon as they arise. P&G now has more than 50 Business Spheres around the world.

P&G can now obtain the same data about point of sale, inventory, ad spending, and shipment data that it did years ago—it just obtains that data much faster and at more frequent time intervals. The improved

analytics tools at the company's disposal means that the same information is presented with more granularity and specificity than ever before.

The Business Sphere is mostly used by upper-level P&G managers and executives, but the company was determined to extend the same principles deeper within the business. That's where the Decision Cockpits come in. P&G has started to give more of its employees access to the same common data sources–over 58,000 employees now use the technology. These cockpits are dashboards displaying easy-to-read charts illustrating business status and trends. The cockpits feature automated alerts when important events occur, control charts, statistical analyses in real time, and the ability to "drill down" to more detailed levels of data.

One of the major goals of the Decision Cockpits was to eliminate time spent by P&G employees debating the validity of competing versions of data found in e-mails, spreadsheets, letters, and reports. By providing a one-stop source of accurate and detailed real-time business data, all P&G employees are able to focus instead on decisions for improving the business. Both the Business Sphere and Decision Cockpits encourage P&G employees and managers to "manage by exception." This means that by looking at the data and taking note of the exceptions, such as regions that are losing market share the fastest, or areas that are booming and require more resources, P&G can devote time and energy where it is most needed.

Managers and employees are now able to make faster and better decisions than were previously possible. Other benefits of the project have been the reduced complexity involved in generating a statistical report, as well as cost reductions from maintaining one standardized set of data across the enterprise instead of duplicated, redundant data. P&G has seen the number of e-mails generated by employees drop sharply, as more workers can answer their own questions and obtain their own information using Decision Cockpits. Better messaging and video will help employees pull in anyone needed to make a decision. The company is also able to better anticipate future events affecting the business and more quickly respond to market stimuli.

Sources: Shirish Netke and Ravi Kalakota, "Procter & Gamble — A Case Study in Business Analytics," SmartAnalytics, March 5, 2012; Chris Murphy, "Hard Calls, Big Risks, and Heated Debate," *Information Week*, August 13, 2012; Brian P. Watson, "Data Wrangling: How Procter and Gamble Maximizes Business Analytics," *CIO Insight*, January 30, 2012; Chris Murphy, "Procter & Gamble CIO Filippo Passerini: 2010 Chief Of The Year," *InformationWeek*, December 4, 2010.

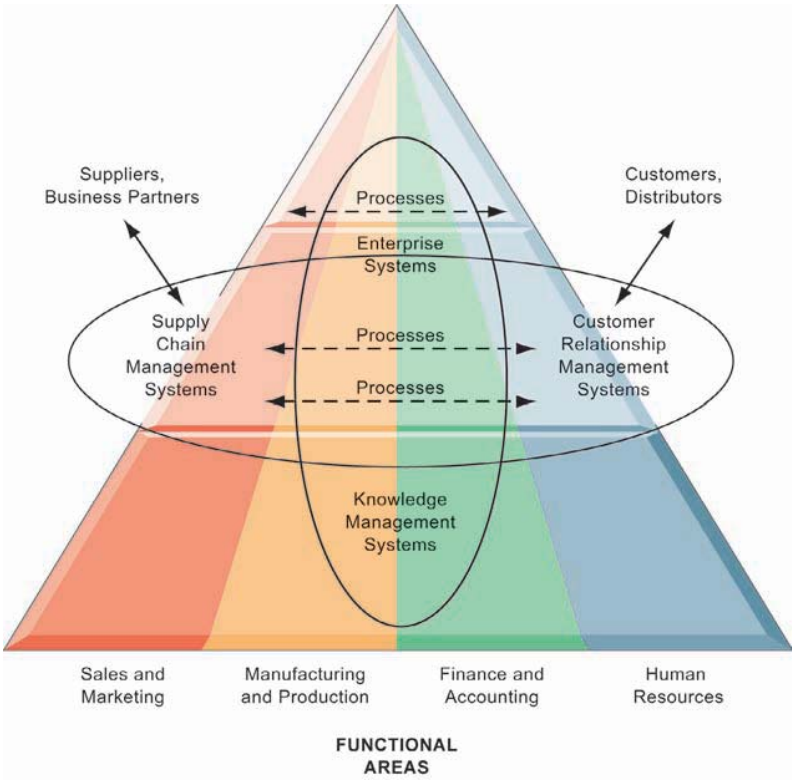
CASE STUDY QUESTIONS

1. What management, organization, and technology issues had to be addressed when implementing Business Sufficiency, Business Sphere, and Decision Cockpits?
2. How did these decision-making tools change the way the company ran its business? How effective are they? Why?
3. How are these systems related to P&G's business strategy?

customer an invoice. Customer service representatives track the progress of the order through every step to inform customers about the status of their orders. Managers are able to use firmwide information to make more precise and timely decisions about daily operations and longer-term planning.

Supply Chain Management Systems Firms use **supply chain management (SCM) systems** to help manage relationships with their suppliers. These systems help suppliers, purchasing firms, distributors, and logistics companies share information about orders, production, inventory levels, and delivery of products and services so 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 in the least amount of time and at the lowest cost. These systems increase firm profitability by

FIGURE 2.6 ENTERPRISE APPLICATION ARCHITECTURE



Enterprise applications automate processes that span multiple business functions and organizational levels and may extend outside the organization.

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.

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.

Customer Relationship Management Systems Firms use **customer relationship management (CRM) systems** to help 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.

Knowledge Management Systems 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 unique, difficult to imitate, 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.

We examine enterprise systems and systems for supply chain management and customer relationship management in greater detail in Chapter 9. We discuss collaboration systems that support knowledge management in this chapter and cover other types of knowledge management applications in Chapter 11.

Intranets and Extranets

Enterprise applications create deep-seated changes in the way the firm conducts its business, offering many opportunities to integrate important business data into a single system. They are often costly and difficult to implement. Intranets and extranets deserve mention here as alternative tools for increasing integration and expediting the flow of information within the firm, and with customers ad suppliers.

Intranets are simply internal company Web sites that are accessible only by employees. The term "intranet" refers to an internal network, in contrast to the Internet, which is a public network linking organizations and other external networks. Intranets use the same technologies and techniques as the larger Internet, and they often are simply a private access area in a larger company Web site. Likewise with extranets. Extranets are company Web sites that are accessible to authorized vendors and suppliers, and are often used to coordinate the movement of supplies to the firm's production apparatus.

For example, Six Flags, which operates 19 theme parks throughout North America, maintains an intranet for its 2,500 full-time employees that provides company-related news and information on each park's day-to-day operations, including weather forecasts, performance schedules, and details about groups and celebrities visiting the parks. The company also uses an extranet to broadcast information about schedule changes and park events to its 30,000 seasonal employees. We describe the technology for intranets and extranets in more detail in Chapter 7.

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 makes government operations more efficient and also empowers 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.

2.3 Systems for Collaboration and Social Business

With all these systems and information, you might wonder how is it possible to make sense 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. In addition to the types of systems we have just described, businesses need special systems to support collaboration and teamwork.

WHAT IS COLLABORATION?

Collaboration is working with others to achieve shared and explicit goals. Collaboration focuses on task or mission accomplishment and usually takes place in a business, or other organization, and between businesses. You collaborate with a colleague in Tokyo having expertise on a topic about which you know nothing. You collaborate with many colleagues in publishing a company blog. If you're in a law firm, you collaborate with accountants in an accounting firm in servicing the needs of a client with tax problems.

Collaboration can be short-lived, lasting a few minutes, or longer term, depending on the nature of the task and the relationship among participants. Collaboration can be one-to-one or many-to-many.

Employees may collaborate in informal groups that are not a formal part of the business firm's organizational structure or they may be organized into formal teams. **Teams** have a specific mission that someone in the business assigned to them. Team members need to collaborate on the accomplishment of specific tasks and collectively achieve the team mission. The team mission might be to "win the game," or "increase online sales by 10 percent." Teams are often short-lived, depending on the problems they tackle and the length of time needed to find a solution and accomplish the mission.

Collaboration and teamwork are more important today than ever for a variety of reasons.

- *Changing nature of work*. The nature of work has changed from factory manufacturing and pre-computer office work where each stage in the production process occurred independently of one another, and was coordinated by supervisors. Work was organized into silos. Within a silo, work passed from one machine tool station to another, from one desktop to another, until the finished product was completed. Today, jobs require much closer coordination and interaction among the parties involved in producing the service or product. A recent report from the consulting firm McKinsey & 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. Even in factories, workers today often work in production groups, or pods.

- *Growth of professional work.* "Interaction" jobs tend to be professional jobs in the service sector that require close coordination and collaboration. Professional jobs require substantial education, and the sharing of information and opinions to get work done. Each actor on the job brings specialized expertise to the problem, and all the actors need to take one another into account in order to accomplish the job.
- *Changing organization of the firm*. For most of the industrial age, managers organized work in a hierarchical fashion. Orders came down the hierarchy, and responses moved back up the hierarchy. Today, work is organized into groups and teams, and the members are expected to develop their own methods for accomplishing the task. Senior managers observe and measure results, but are much less likely to issue detailed orders or operating procedures. In part, this is because expertise and decision-making power have been pushed down in organizations.
- *Changing scope of the firm*. The work of the firm has changed from a single location to multiple locations—offices or factories throughout a region, a nation, or even around the globe. For instance, Henry Ford developed the first mass-production automobile plant at a single Dearborn, Michigan factory. In 2012, Ford employed over 166,000 people at around 90 plants and facilities worldwide. With this kind of global presence, the need for close coordination of design, production,marketing, distribution, and service obviously takes on new importance and scale. Large global companies need to have teams working on a global basis.
- *Emphasis on innovation*. Although we tend to attribute innovations in business and science to great individuals, these great individuals are most likely working with a team of brilliant colleagues. Think of Bill Gates and Steve Jobs (founders of Microsoft and Apple), both of whom are highly regarded innovators, and both of whom built strong collaborative teams to nurture and support innovation in their firms. Their initial innovations derived from close collaboration with colleagues and partners. Innovation, in other words, is a group and social process, and most innovations derive from collaboration among individuals in a lab, a business, or government agencies. Strong collaborative practices and technologies are believed to increase the rate and quality of innovation.
- *Changing culture of work and business*. Most research on collaboration supports the notion that diverse teams produce better outputs, faster, than individuals working on their own. Popular notions of the crowd ("crowdsourcing," and the "wisdom of crowds") also provide cultural support for collaboration and teamwork.

WHAT IS SOCIAL BUSINESS?

Many firms today enhance collaboration by embracing **social business**—the use of social networking platforms, including Facebook, Twitter, and internal corporate social tools—to engage their employees, customers, and suppliers. These tools enable workers to set up profiles, form groups, and "follow" each other's status updates. The goal of social business is to deepen interactions with groups inside and outside the firm to expedite and enhance information-sharing, innovation, and decision making.

A key word in social business is "conversations." Customers, suppliers, employees, managers, and even oversight agencies continually have conversations about firms, often without the knowledge of the firm or its key actors (employees and managers).

Supporters of social business argue that, if firms could tune into these conversations, they would strengthen their bonds with consumers, suppliers, and employees, increasing their emotional involvement in the firm.

All of this requires a great deal of information transparency. People need to share opinions and facts with others quite directly, without intervention from executives or others. Employees get to know directly what customers and other employees think; suppliers will learn very directly the opinions of supply chain partners; and even managers presumably will learn more directly from their employees how well they are doing. Nearly everyone involved in the creation of value will know much more about everyone else.

If such an environment could be created, it is likely to drive operational efficiencies, spur innovation, and accelerate decision making. If product designers can learn directly about how their products are doing in the market in real time, based on consumer feedback, they can speed up the redesign process. If employees can use social connections inside and outside the company to capture new knowledge and insights, they will be able to work more efficiently and solve more business problems.

Table 2.2 describes important applications of social business inside and outside the firm. This chapter focuses on enterprise social business—its internal corporate uses. Chapters 7 and 10 describe social business applications relating to customers and suppliers outside the company.

BUSINESS BENEFITS OF COLLABORATION AND SOCIAL BUSINESS

Although many articles and books have been written about collaboration, nearly all of the research on this topic is anecdotal. Nevertheless, there is a general belief among both business and academic communities that the more a business firm is "collaborative," the more successful it will be, and that collaboration within and among firms is more essential than in the past. A recent global survey of business and information systems managers found that investments in collaboration technology produced organizational improvements that returned over four times the amount of the investment, with the greatest benefits for sales, marketing, and research and development functions (Frost and White, 2009).

TABLE 2.2 APPLICATIONS OF SOCIAL BUSINESS

SOCIAL BUSINESS APPLICATION	DESCRIPTION
Social networks	Connect through personal and business profiles
Crowdsourcing	Harness collective knowledge to generate new ideas and solutions
Shared workspaces	Coordinate projects and tasks; co-create content
Blogs and wikis	Publish and rapidly access knowledge; discuss opinions and experiences
Social commerce	Share opinions about purchasing or purchase on social platforms
File sharing	Upload, share, and comment on photos, videos, audio, text documents
Social marketing	Use social media to interact with customers; derive customer insights
Communities	Discuss topics in open forums; share expertise

TABLE 2.3 BUSINESS BENEFITS OF COLLABORATION AND SOCIAL BUSINESS

BENEFIT	RATIONALE
Productivity	People interacting and working together can capture expert knowledge and solve problems more rapidly than the same number of people working in isolation from one another. There will be fewer errors.
Quality	People working collaboratively can communicate errors, and corrective actions faster than if they work in isolation. Collaborative and take social technologies help reduce time delays in design and production.
Innovation	People working collaboratively can come up with more innovative ideas for products, services, and administration than the same number working in isolation from one another. Advantages to diversity and the "wisdom of crowds."
Customer service	People working together using collaboration and social tools can solve customer complaints and issues faster and more effectively than if they were working in isolation from one another.
Financial performance (profitability, sales, and sales growth)	As a result of all of the above, collaborative firms have superior sales, sales growth, and financial performance.

Another study of the value of collaboration also found that the overall economic benefit of collaboration was significant: for every word seen by an employee in e-mails from others, $70 of additional revenue was generated (Aral, Brynjolfsson, and Van Alstyne, 2007). McKinsey & Company consultants predict that social technologies used within and across enterprises could potentially raise the productivity of interaction workers by 20 to 25 percent (McKinsey, 2012).

Table 2.3 summarizes some of the benefits of collaboration and social business that have been identified. Figure 2.7 graphically illustrates how collaboration is believed to impact business performance.

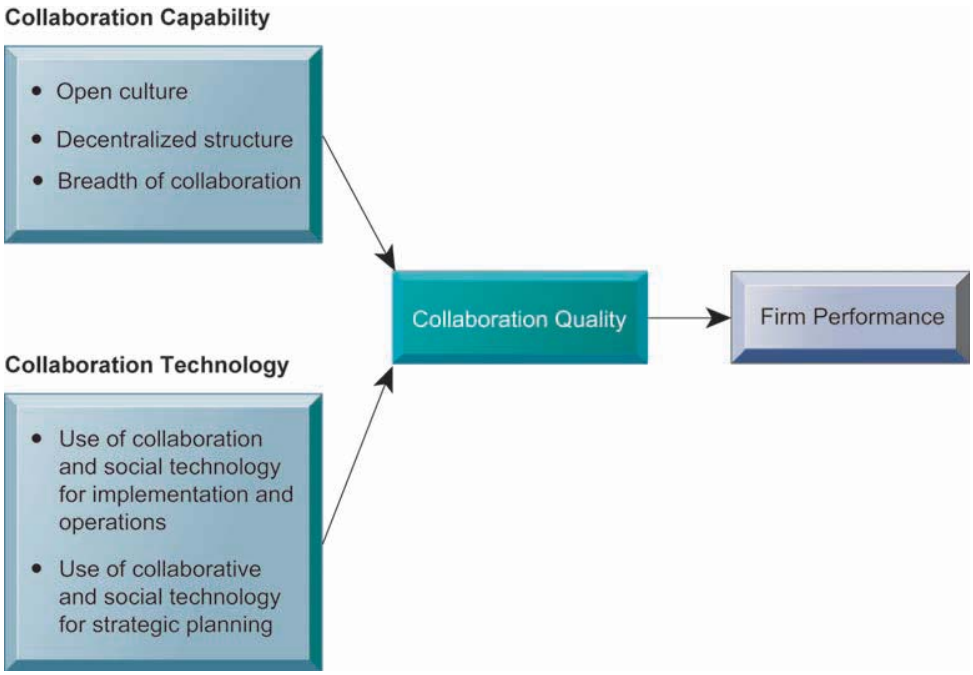
BUILDING A COLLABORATIVE CULTURE AND BUSINESS PROCESSES

Collaboration won't take place spontaneously in a business firm, especially if there is no supportive culture or business processes. Business firms, especially large firms, had a reputation in the past for being "command and control" organizations where the top leaders thought up all the really important matters, and then ordered lower-level employees to execute senior management plans. The job of middle management supposedly was to pass messages back and forth, up and down the hierarchy.

Command and control firms required lower-level employees to carry out orders without asking too many questions, with no responsibility to improve processes, and with no rewards for teamwork or team performance. If your work group needed help from another work group, that was something for the bosses to figure out. You never communicated horizontally, always vertically, so management could control the process. Together, the expectations of management and employees formed a culture, a set of assumptions about common goals and how people should behave. Many business firms still operate this way.

A collaborative business culture and business processes are very different. Senior managers are responsible for achieving results, but rely on teams of employees to achieve and implement the results. Policies, products, designs,

FIGURE 2.7 REQUIREMENTS FOR COLLABORATION



Successful collaboration requires an appropriate organizational structure and culture, along with appropriate collaboration technology.

processes, and systems are much more dependent on teams at all levels of the organization to devise, to create, and to build. Teams are rewarded for their performance, and individuals are rewarded for their performance in a team. The function of middle managers is to build the teams, coordinate their work, and monitor their performance. The business culture and business processes are more "social." In a collaborative culture, senior management establishes collaboration and teamwork as vital to the organization, and it actually implements collaboration for the senior ranks of the business as well.

TOOLS AND TECHNOLOGIES FOR COLLABORATION AND SOCIAL BUSINESS

A collaborative, team-oriented culture won't produce benefits without information systems in place to enable collaboration and social business. Hundreds of tools are designed to deal with the fact that, in order to succeed in our jobs, we must depend on one another—our fellow employees, customers, suppliers, and managers. Some high-end tools like IBM Lotus Notes are expensive, but powerful enough for global firms. Others are available online for free (or with premium versions for a modest fee) and are suitable for small businesses. Let's look more closely at some of these tools.

E-mail and Instant Messaging (IM)

E-mail and instant messaging (including text messaging) have been major communication and collaboration tools for interaction jobs. Their software operates on computers, cell phones, and other wireless handheld devices and includes features for sharing files as well as transmitting messages. Many

instant messaging systems allow users to engage in real-time conversations with multiple participants simultaneously. In recent years, e-mail use has declined, with messaging and social media becoming preferred channels of communication.

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, the largest collaboratively edited reference project in the world. It relies on volunteers, makes no money, and accepts no advertising.

Wikis are very useful tools for storing and sharing corporate 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.

Virtual Worlds

Virtual worlds, such as Second Life, are online 3-D environments populated by "residents" who have built 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 using gestures, chat box conversations, and voice communication (which requires microphones).

Collaboration and Social Business Platforms

There are now suites of software products providing multi-function platforms for collaboration and social business among teams of employees who work together from many different locations. The most widely used are Internet-based audio conferencing and videoconferencing systems, online software services such as Google Apps/Google Sites, cyberlockers, corporate collaboration systems such as Lotus Notes and Microsoft SharePoint, and enterprise social networking tools such as Salesforce Chatter, Microsoft Yammer, Jive, and IBM Connections and SmartCloud for Business.

Virtual Meeting Systems In an effort to reduce travel expenses, many companies, both large and small, are adopting videoconferencing and Web conferencing technologies. Companies such as Heinz, General Electric, Pepsico, and Wachovia are using virtual meeting systems for product briefings, training courses, strategy sessions, and even inspirational chats.

A videoconference allows individuals at two or more locations to communicate simultaneously through two-way video and audio transmissions. High-end videoconferencing systems feature **telepresence** technology, an integrated audio and visual environment that allows a person to give the appearance of being present at a location other than his or her true physical location. Free or low-cost Internet-based systems such as Skype group videoconferencing, Zoom.us, and ooVoo are of lower quality, but still useful for smaller companies. Apple's FaceTime and Google video chat tools are useful tools for one-to-one videoconferencing.

Companies of all sizes are finding Web-based online meeting tools such as Cisco WebEx, Microsoft Live Meeting, and Adobe Connect especially helpful for training and sales presentations. These products enable participants to share documents and presentations in conjunction with audio conferencing and live video via Webcam.

Google Apps/Google Sites and Cloud Collaboration Services One of the most widely used "free" online services for collaboration is Google Apps/Google Sites. Google Sites allows users to quickly create online group-editable Web sites. Google Sites is one part of the larger Google Apps suite of tools. Google Sites users can design and populate Web sites in minutes and can, without any advanced technical skills, post a variety of files including calendars, text, spreadsheets, and videos for private, group, or public viewing and editing.

Google Apps work with Google Sites and include the typical desktop productivity office software tools (word processing, spreadsheet, presentation, contact management, messaging, and mail). A Premier edition charging businesses $50 per year for each user offers 25 gigabytes of mail storage, a 99.9 percent uptime guarantee for e-mail, tools to integrate with the firm's existing infrastructure, and 24/7 phone support. Table 2.4 describes some of the capabilities of Google Apps/GoogleSites.

Google Drive is an example of a cloud-based **cyberlocker**. Cyberlockers are online file-sharing services that allow users to upload files to secure online storage sites from which the files can be shared with others. Google Drive offers 5 free gigabytes of online storage, with additional monthly charges for more storage up to 16 terabytes. This service works on multiple operating systems, browsers, and mobile devices. Users can create and edit some types of documents online, synchronize these files with all of their devices, and share them with other people. Google Docs is built into Google Drive, enabling users to work in real-time on documents, spreadsheets, and presentations and receive notifications when there are comments.

Other cyberlocker services used for collaboration include Dropbox and Microsoft SkyDrive, with both free and paid services, depending on the amount of storage space required. Users are able to synchronize their files stored online

TABLE 2.4 GOOGLE APPS/GOOGLE SITES COLLABORATION FEATURES

GOOGLE APPS/GOOGLE SITES CAPABILITY	DESCRIPTION
Google Calendar	Private and shared calendars; multiple calendars.
Google Gmail	Google's free online e-mail service, with mobile access capabilities
Google Talk	Instant messaging; text, voice, and voice chat
Google Docs	Online word processing, electronic presentation software, spreadsheets; drawings; online editing, sharing, publishing
Google Sites	Team collaboration sites for sharing of documents, schedules, calendars, searching documents; creation of group wikis
Google Drive	Offers 5 free gigabytes of online storage for 30 types of documents as well as images and HD video; users can create and edit some types of documents online and synchronize these files with all of their devices; ability to view, comment, or edit files based on different usage rights and to keep the files private

with their local PCs and many other kinds of devices, with options for making the files private or public and sharing them with designated contacts. Microsoft SkyDrive offers 7 gigabytes of free online storage for Office documents and other files and works with Microsoft's Web versions of Word, Excel, PowerPoint, and OneNote called Office Web Apps. Dropbox (offering 2 gigabytes of free storage) itself does not include tools for document creation and editing.

Microsoft SharePoint Microsoft SharePoint is a browser-based collaboration and document management platform, combined with a powerful search engine that is installed on corporate servers. SharePoint has a Web-based interface and close integration with everyday tools such as Microsoft Office desktop software products. SharePoint software makes it possible for employees to share their documents and collaborate on projects using Office documents as the foundation.

SharePoint can be used to host internal Web sites that organize and store information in one central workspace to enable teams to coordinate work activities, collaborate on and publish documents, maintain task lists, implement workflows, and share information via wikis and blogs. Users are able to control versions of documents and document security. Because SharePoint stores and organizes information in one place, users can find relevant information quickly and efficiently while working together closely on tasks, projects, and documents. Enterprise search tools help locate people, expertise, and content. As noted in the chapter-opening case, SharePoint has recently added social tools.

ICA is a large Mexican construction company specializing in infrastructure projects, with operations in North, South, and Central America and Europe. The company implemented Microsoft SharePoint Server 2010 to organize the 500,000 documents used by its 3,000 employees daily. ICA employees can now immediately locate the documents and internal expertise they need to finish projects on time and within budget. Project documentation is far more secure, and ICA has created online communities where it can capture the knowledge of internal experts (Microsoft, 2011).

Lotus Notes Lotus Notes was an early example of groupware, a collaborative software system with capabilities for sharing calendars, collective writing and editing, shared database access, and electronic meetings, with each participant able to see and display information from others and other activities. Notes software installed on desktop or laptop computers obtains applications stored on an IBM Lotus Domino server. Lotus Notes is now Web-enabled with a scripting and application development environment so that users can build custom applications to suit their unique needs.

Notes software installed on the user's client computer allows the machine to be used as a platform for e-mail, instant messaging (working with Lotus Sametime), Web browsing, and calendar/resource reservation work, as well as for interacting with collaborative applications. Today, Notes also has capabilities for blogs, microblogs, wikis, RSS aggregators, help desk systems, voice and videoconferencing, and online meetings.

Large firms adopt IBM Lotus Notes because Notes promises high levels of security and reliability, and the ability to retain control over sensitive corporate information. For example, the Magnum AS Group, which specializes in wholesale and retail sales of pharmaceuticals and medical supplies throughout the Baltic States, uses Lotus Notes to manage more than 500,000 documents and meet strict regulatory requirements. The software provides a central document repository with full version control for all company documentation, which includes written documents, spreadsheets, images, PDF files, and e-mails. Users are able to find the latest version of a document with a single search. Documents can only be edited by authorized users, enhancing security and

simplifying compliance with the stringent regulations and audit requirements of the international pharmaceuticals industry (IBM, 2010).

Two related IBM Lotus products provide more specialized teamwork and social networking tools and are able to access information from Lotus Notes. IBM Lotus Quickr helps teams of people share documents and information using team spaces, content libraries, discussion forums, and wikis. IBM Connections supports internal corporate social networking with capabilities for searchable profiles, communities, blogs, activities, wikis, and forums.

Roland Corporation, a Japanese manufacturer of electric musical instruments, musical amplifiers, professional video and audio, and computer music equipment, uses Lotus Quickr and IBM Connections to foster creativity and collaboration among its 3,100 employees worldwide. It now has an "electronic public square" that facilitates sharing of concepts and ideas as they develop. Lotus Quickr helps the company manage and track projects, such as a new product launch where 90 percent of the 200 employees involved worked overseas. The software gathered and stored all the product launch information and made it much easier to set up Web sites for the accompanying sales activities. Connections increased the visibility of the specialists and expertise within the company and helped employees informally share information and ideas (IBM, 2011).

Enterprise Social Networking Tools The tools we have just described include capabilities for supporting social business, but there are also more specialized social tools for this purpose, such as Salesforce Chatter, Microsoft's Yammer, Jive, and IBM Connections. Enterprise social networking tools create business value by connecting the members of an organization through profiles, updates, and notifications, similar to Facebook features, but tailored to internal corporate uses. IBM recently introduced a set of social business tools running on a cloud platform called SmartCloud for Social Business, featuring user profiles, communities, e-mail, instant messaging, Web meetings, calendars, personal dashboards, and file sharing.

Table 2.5 provides more detail about these internal social capabilities.

TABLE 2.5 ENTERPRISE SOCIAL NETWORKING SOFTWARE CAPABILITIES

SOCIAL SOFTWARE CAPABILITY	DESCRIPTION
Profiles	Ability to set up member profiles describing who individuals are, educational background, interests. Includes work-related associations and expertise (skills, projects, teams).
Content sharing	Share, store, and manage content including documents, presentations, images, and videos.
Feeds and notifications	Real-time information streams, status updates, and announcements from designated individuals and groups.
Groups and team workspaces	Establish groups to share information, collaborate on documents, and work on projects, with the ability to set up private and public groups and to archive conversations to preserve team knowledge.
Tagging and social bookmarking	Indicate preferences for specific pieces of content, similar to the Facebook Like button. Tagging lets people add keywords to identify content they like.
Permissions and privacy	Ability to make sure private information stays within the right circles, as determined by the nature of relationships. In enterprise social networks,there is a need to establish who in the company has permission to see what information.

Dallas-based 7-Eleven Inc. has about 2,000 employees who have used Yammer since May 2011. The convenience store chain deployed the application to help field consultants, who work with local franchise owners, share their knowledge and learn best practices from one another. For example, someone might post a picture of a display that worked particularly well in one franchise location for others to see and try in their locations. The social software creates a "virtual water cooler" environment where people are able to talk about what's going on in an informal way yet have formal documentation to keep track of best practices.

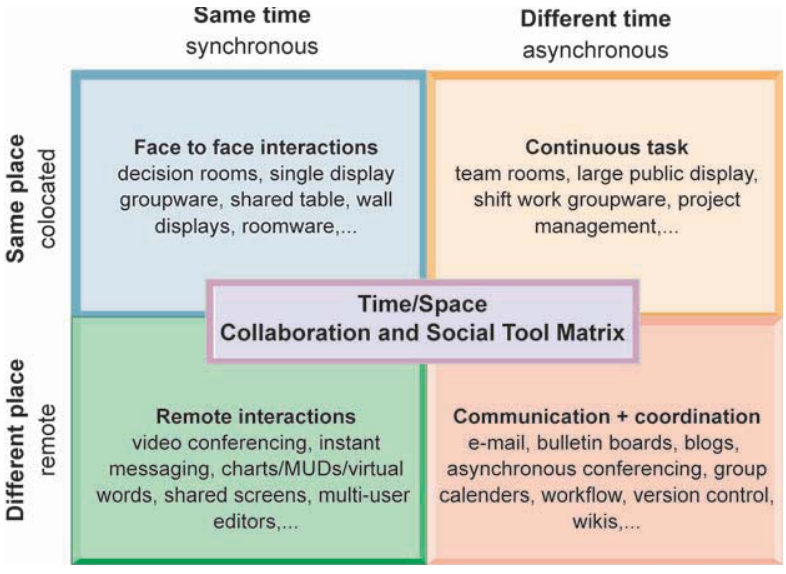
Although 7-Eleven and other companies have benefited from enterprise social networking, internal social networking has not caught on as quickly as consumer uses of Facebook, Twitter, and other public social networking products.

Checklist for Managers: Evaluating and Selecting Collaboration and Social Software Tools

With so many collaboration and social business tools and services available, how do you choose the right collaboration technology for your firm? To answer this question, you need a framework for understanding just what problems these tools are designed to solve. One framework that has been helpful for us to talk about collaboration tools is the time/space collaboration matrix developed in the early 1990s by a number of collaborative work scholars (Figure 2.8).

The time/space matrix focuses on two dimensions of the collaboration problem: time and space. For instance, you need to collaborate with people in different time zones and you cannot all meet at the same time. Midnight in New York is noon in Bombay, so this makes it difficult to have a videoconference (the people in New York are too tired). Time is clearly an obstacle to collaboration on a global scale.

FIGURE 2.8 THE TIME/SPACE COLLABORATION AND SOCIAL TOOL MATRIX



Collaboration and social technologies can be classified in terms of whether they support interactions at the same or different time or place, and whether these interactions are remote or colocated.

Place (location) also inhibits collaboration in large global or even national and regional firms. Assembling people for a physical meeting is made difficult by the physical dispersion of distributed firms (firms with more than one location), the cost of travel, and the time limitations of managers.

The collaboration and social technologies we have just described are ways of overcoming the limitations of time and space. Using this time/space framework will help you to choose the most appropriate collaboration and teamwork tools for your firm. Note that some tools are applicable in more than one time/place scenario. For example, Internet collaboration suites such as Lotus Notes have capabilities for both synchronous (instant messaging, electronic meeting tools) and asynchronous (e-mail, wikis, document editing) interactions.

Here's a "to-do" list to get started. If you follow these six steps, you should be led to investing in the correct collaboration software for your firm at a price you can afford, and within your risk tolerance.

1. What are the collaboration challenges facing the firm in terms of time and space? Locate your firm in the time/space matrix. Your firm can occupy more than one cell in the matrix. Different collaboration tools will be needed for each situation.
2. Within each cell of the matrix where your firm faces challenges, exactly what kinds of solutions are available? Make a list of vendor products.
3. Analyze each of the products in terms of their cost and benefits to your firm. Be sure to include the costs of training in your cost estimates, and the costs of involving the information systems department, if needed.
4. Identify the risks to security and vulnerability involved with each of the products. Is your firm willing to put proprietary information into the hands of external service providers over the Internet? Is your firm willing to risk its important operations to systems controlled by other firms? What are the financial risks facing your vendors? Will they be here in three to five years? What would be the cost of making a switch to another vendor in the event the vendor firm fails?
5. Seek the help of potential users to identify implementation and training issues. Some of these tools are easier to use than others.
6. Make your selection of candidate tools, and invite the vendors to make presentations.

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 5.

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. Also, 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 8). (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 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.

In the next five years, employment growth in IS/MIS jobs will be about 50 percent greater than the average job growth in other fields. Out of 114

occupations, MIS is ranked 15th in terms of salaries. While all IS occupations show above-average growth, the fastest growing occupations are computer support specialists (30%), systems analysts (21%), software engineers and programmers (20%), and information systems managers (17%) (Bureau of Labor Statistics, 2012). With businesses and government agencies increasingly relying on the Internet for computing and communication resources, system and network security management positions are especially in demand. See the Learning Track for this chapter titled "Occupational and Career Outlook for Information Systems Majors 2012–2018" for more details on IS job opportunities.

ORGANIZING THE INFORMATION SYSTEMS FUNCTION

There are many types of business firms, and there are many ways in which the IT function is organized within the firm. A very small company will not have a formal information systems group. It might have one employee who is responsible for keeping its networks and applications running, or it might use consultants for these services. Larger companies will have a separate information systems department, which may be organized along several different lines, depending on the nature and interests of the firm. Our Learning Track describes alternative ways of organizing the information systems function within the business.

The question of how the information systems department should be organized is part of the larger issue of IT governance. **IT governance** includes the strategy and policies for using information technology within an organization. It specifies the decision rights and framework for accountability to ensure that the use of information technology supports the organization's strategies and objectives. How much should the information systems function be centralized? What decisions must be made to ensure effective management and use of information technology, including the return on IT investments? Who should make these decisions? How will these decisions be made and monitored? Firms with superior IT governance will have clearly thought out the answers (Weill and Ross, 2004).

Learning Track Modules

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

1. Systems from a Functional Perspective
2. IT Enables Collaboration and Teamwork
3. Challenges of Using Business Information Systems
4. Organizing the Information Systems Function
5. Occupational and Career Outlook for Information Systems Majors 2012–2018

Review Summary

1. *What are business processes? How are they related to information systems?*

A business process is a logically related set of activities that defines how specific business tasks are performed, and it represents a unique way in which an organization coordinates work, information, and knowledge. Managers need to pay attention to business processes because they determine how well the organization can execute its business, and they may be a source of strategic advantage. There are business processes specific to each of the major business functions, but many business processes are cross-functional. Information systems automate parts of business processes, and they can help organizations redesign and streamline these processes.

2. *How do systems serve the different management groups in a business?*

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) produce reports serving middle management by condensing information from TPS, and these are not highly analytical. Decision-support systems (DSS) support management decisions that are unique and rapidly changing using advanced analytical models. All of these types of systems provide business intelligence that helps managers and enterprise employees make more informed decisions. These systems for business intelligence serve multiple levels of management, and include executive support systems (ESS) for senior management that provide data in the form of graphs, charts, and dashboards delivered via portals using many sources of internal and external information.

3. *How do systems that link the enterprise improve organizational performance?*

Enterprise applications 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 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 (CRM) systems coordinate the business processes surrounding the firm's customers. Knowledge management systems enable firms to optimize the creation, sharing, and distribution of knowledge. Intranets and extranets are private corporate networks based on Internet technology that assemble information from disparate systems. Extranets make portions of private corporate intranets available to outsiders.

4. *Why are systems for collaboration and social business so important and what technologies do they use?*

Collaboration is working with others to achieve shared and explicit goals. Social business is the use of internal and external social networking platforms to engage employees, customers, and suppliers, and it can enhance collaborative work. Collaboration and social business have become increasingly important in business because of globalization, the decentralization of decision making, and growth in jobs where interaction is the primary value-adding activity. Collaboration and social business enhance innovation, productivity, quality, and customer service. Tools for collaboration and social business include e-mail and instant messaging, wikis, virtual meeting systems, virtual worlds, cyberlockers, collaboration platforms such as Google Sites/Google Apps, Microsoft SharePoint, and Lotus Notes, and enterprise social networking tools such as Chatter, Yammer, Jive, and IBM Connections.

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 intelligence, 77
Chief information officer (CIO), 99
Chief knowledge officer (CKO), 99
Chief privacy officer (CPO), 99
Chief security officer (CSO), 99
Collaboration, 88
Customer relationship management (CRM) systems, 86
Cyberlockers, 94
Decision-support systems (DSS), 79
Digital dashboard, 82
Electronic business (e-business), 87
Electronic commerce (e-commerce), 87
E-government, 87
End users, 99
Enterprise applications, 83
Enterprise systems, 83
Executive support systems (ESS), 82
Information systems department, 98
Information systems managers, 99
Interorganizational system, 86
IT governance, 100
Knowledge management systems (KMS), 86
Management information systems (MIS), 77
Portal, 82
Programmers, 99
Social business, 89
Supply chain management (SCM) systems, 85
Systems analysts, 99
Teams, 88
Telepresence, 93
Transaction processing systems (TPS), 76

Review Questions

1. What are business processes? How are they related to information systems?
   - Define business processes and describe the role they play in organizations.
   - Describe the relationship between information systems and business processes.
2. How do systems serve the different management groups in a business?
   - Describe the characteristics of transaction processing systems (TPS) and the roles they play in a business.
   - Describe the characteristics of management information systems (MIS) and explain how MIS differ from TPS and from DSS.
   - Describe the characteristics of decision-support systems (DSS) and how they benefit businesses.
   - Describe the characteristics of executive support systems (ESS) and explain how these systems differ from DSS.
3. How do systems that link the enterprise improve organizational performance?
   - Explain how enterprise applications improve organizational performance.
   - Define enterprise systems, supply chain management systems, customer relationship management systems, and knowledge management systems and describe their business benefits.
   - Explain how intranets and extranets help firms integrate information and business processes.
4. Why are systems for collaboration and social business so important and what technologies do they use?
   - Define collaboration and social business, and explain why they have become so important in business today.
   - List and describe the business benefits of collaboration and social business.
   - Describe a supportive organizational culture and business processes for collaboration.
   - List and describe the various types of collaboration and social business tools.
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 2.1? What are the most important pieces of information these systems should capture? Explain your answer.
2. Identify the steps that are performed in the process of selecting and checking out a book from your college library and the information that flows among these activities. Diagram the process. Are there any ways this process could be improved to improve the performance of your library or your school? Diagram the improved process.
3. Use the Time/Space Collaboration and Social Tool Matrix to classify the collaboration and social technologies used by TELUS.

Hands-On MIS Projects

The projects in this section give you hands-on experience analyzing opportunities to improve business processes with new information system applications, using a spreadsheet to improve decision making about suppliers, and using Internet software to plan efficient transportation routes.

Management Decision Problems

1. Don's Lumber Company on the Hudson River features a large selection of materials for flooring, decks, moldings,windows, siding, and roofing. The prices of lumber and other building materials are constantly changing. When a customer inquires about the price on pre-finished wood flooring, sales representatives consult a manual price sheet and then call the supplier for the most recent price. The supplier in turn uses a manual price sheet, which has been updated each day. Often, the supplier must call back Don's sales reps because the company does not have the newest pricing information immediately on hand. Assess the business impact of this situation, describe how this process could be improved with information technology, and identify the decisions that would have to be made to implement a solution.
2. Henry's Hardware is a small family business in Sacramento, California. The owners, Henry and Kathleen, must use every square foot of store space as profitably as possible. They have never kept detailed inventory or sales records. As soon as a shipment of goods arrives, the items are immediately placed on store shelves. Invoices from suppliers are only kept for tax purposes. When an item is sold, the item number and price are rung up at the cash register. The owners use their own judgment in identifying items that need to be reordered.What is the business impact of this situation? How could information systems help Henry and Kathleen run their business? What data should these systems capture? What decisions could the systems improve?

Improving Decision Making: Using a Spreadsheet to Select Suppliers

Software skills: Spreadsheet date functions, data filtering, DAVERAGE 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 filter transactional data on suppliers 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. In MyMISLab, 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

Software skills: Internet-based software
Business skills: Transportation planning

In this exercise, you will use MapQuest software to map out transportation routes for a business and select the most efficient route.

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?

Video Cases

Video Cases and Instructional Videos illustrating some of the concepts in this chapter are available. Contact your instructor to access these videos.

Collaboration and Teamwork Project

In MyMISLab, you will find a Collaboration and Teamwork Project dealing with the concepts in this chapter. You will be able to use Google Sites, Google Docs, and other open-source collaboration tools to complete the assignment.

Modernization of NTUC Income
CASE STUDY

NTUC Income ("Income"), one of Singapore's largest insurers, has over 1.8 million policy holders with total assets of S$21.3 billion. The insurer employs about 3,400 insurance advisors and 1,200 office staff, with the majority located across an eight-branch network. On June 1, 2003, Income succeeded in the migration of its legacy insurance systems to a digital web-based system. The Herculean task required not only the upgrading of hardware and applications, it also required Income to streamline its decade-old business processes and IT practices.

Until a few years ago, Income's insurance processes were very tedious and paper-based. The entire insurance process started with customers meeting an agent, filling in forms and submitting documents. The agent would then submit the forms at branches, from where they were sent by couriers to the Office Services department. The collection schedule could introduce delays of two to three days. Office Services would log documents, sort them, and then send them to departments for underwriting. Proposals were allocated to underwriting staff, mostly at random. Accepted proposals were sent for printing at the Computer Services department and then redistributed. For storage, all original documents were packed and sent to warehouses where, over two to three days, a total of seven staff would log and store the documents. In all, paper policies comprising 45 million documents were stored in over 16,000 cartons at three warehouses. Whenever a document needed to be retrieved, it would take about two days to locate and ship it by courier. Refiling would again take about two days.

In 2002, despite periodic investments to upgrade the HP 3000 mainframe that hosted the core insurance applications as well as the accounting and management information systems, it still frequently broke down. When a system breakdown did occur, work had to be stopped while data was restored. Additionally, the HP 3000 backup system could only restore the data to the version from the previous day. This meant that backups had to be performed at the end of every day in a costly and tedious process, or the company would risk losing important data. In one of the hardware crashes, it took several months to recover the lost data. In all, the HP 3000 system experienced a total of three major hardware failures, resulting in a total of six days of complete downtime.

That was not enough. The COBOL programs that were developed in the early 1980s and maintained by Income's in-house IT team also broke multiple times, halted the systems, and caused temporary interruptions. In addition, the IT team found developing new products in COBOL to be quite cumbersome and the time taken to launch new products ranged from a few weeks to months.

At the same time, transaction processing for policy underwriting was still a batch process and information was not available to agents and advisors in real-time. As a result, when staff processed a new customer application for motor insurance, they did not know if the applicant was an existing customer of Income, which led to the loss of opportunities for cross-product sales, as staff had to pass physical documents between each other and there was no means of viewing an up-to-date report on a customer's history on demand. Furthermore, compatibility issues between the HP 3000 and employees' notebooks caused ongoing problems, especially with a rise in telecommuting.

All this changed in June 2003, when Income switched to the Java based eBao LifeSystem from eBao Technology. The software comprised three subsystems - Policy Administration, Sales Management and Supplementary Resources — and fulfilled many of the company's requirements, from customer-orientated design to barcode technology capabilities, and the ability to support changes in business processes.

Implementation work started in September 2002 and the project was completed in nine months. By May 2003, all the customization, data migration of Income's individual and group life insurance businesses and training were completed.

The new system was immediately operational on a high-availability platform. All applications resided on two or more servers, each connected by two or more communication lines, all of which were "load balanced." This robust architecture minimized downtime occurrence due to hardware or operating system failures.

As part of eBao implementation, Income decided to replace its entire IT infrastructure with a more

robust, scalable architecture. For example, all servicing branches were equipped with scanners; monitors were changed to 20 inches; PC RAM size was upgraded to 128 MB; and new hardware and software for application servers, database servers, web servers, and disk storage systems were installed. Furthermore, the LAN cables were replaced with faster cables, a fiber-optic backbone, and wireless capability.

In addition, Income also revamped its business continuity and disaster-recovery plans. A real-time hot backup disaster-recovery center was implemented, where the machines were always running and fully operational. Data was transmitted immediately on the fly from the primary datacenter to the backup machines' data storage. In the event of the datacenter site becoming unavailable, the operations could be switched quickly to the disasterrecovery site without the need to rely on restoration of previous day data.

Moving to a paperless environment, however, was not easy. Income had to throw away all paper records, including legal paper documents. Under the new system, all documents were scanned and stored on "trusted" storage devices - secured, reliable digital vaults that enabled strict compliance with stringent statutory requirements. Income had to train employees who had been accustomed to working with paper to use the eBao system and change the way they worked.

As a result of adopting eBao Life System, about 500 office staff and 3,400 insurance advisors could access the system anytime, anywhere. Staff members who would telecommute enjoyed faster access to information, almost as fast as those who accessed the information in the office.

This allowed Income to view a summary of each customer over different products and business areas. As a result, cross-selling became easier, and customer service could be improved. Simplified workflows cut policy processing time and cost by half, and greatly reduced the time required to design and launch new products from months to days.

Additionally, the systems allowed for online support of customers, agents and brokers.

Sources: Melanie Liew, Computerworld, July 2004; "NTUC Income of Singapore Successfully Implemented eBaoTech Lifesystem," ebaotech.com, accessed November 2008; Neerja Sethi & D G Allampallai, "NTUC Income of Singapore (A): Re-architecting Legacy Systems," asiacase.com, October 2005.

CASE STUDY QUESTIONS

1. What were the problems faced by Income in this case? How were the problems resolved by the new digital system?
2. What types of information systems and business processes were used by Income before migrating to the fully digital system?
3. Describe the Information systems and IT infrastructure at Income after migrating to the fully digital system?
4. What benefits did Income reap from the new system?
5. How well is Income prepared for the future? Are the problems described in the case likely to be repeated?

Case contributed by Neerja Sethi and Vijay Sethi, Nanyang Technological University.