chapter 5

Information Systems and Business Transformation

Transformation requires discontinuous thinking—recognizing and shedding outdated rules and fundamental assumptions that underlie operations. Business processes, the cross-functional sets of activities that turn inputs into outputs, are at the heart of how businesses operate and how transformation takes place. This chapter discusses business processes and the systems that support them. The chapter begins with a discussion of a functional (silo) versus a process perspective of a firm, including agile and dynamic business processes. The chapter then focuses on the way managers change business processes, including incremental and radical approaches. Information systems (*IS*) including workflow and business process management systems and enterprise systems that support and automate business processes follow. The chapter concludes by examining when IS drive business transformations and the complexities that arise when companies integrate systems.

Business strategy at Sloan Valve Company,[1] a family-owned global manufacturer of plumbing products, had executives launching a range of new products every year. The new product development (NPD) process was both core and strategic for Sloan, but it was also complex and slow; over 16 functional units were involved, and it often took 18–24 months to bring a new product to market. Sloan Valve's process of initiating and screening new product ideas was broken. More than 50% of the ideas that began the process didn't make it through, resulting in wasted resources. Further, no one was accountable for the process, making it difficult to get a handle on process management and improvement. Information flow was blocked in part because of the structure of the organization.

Management initially invested in an enterprise system to automate the company's internal processes, believing that IS would provide a common language, database, and platform. Despite successful implementation, the communication and coordination problems continued. Further, the new system did not provide an NPD process. Upon deeper analysis by a new CIO brought in to "fix things," management realized that the enterprise system was working fine, but the underlying process was broken. Top management decided to redesign the NPD process.

The NPD process redesign team was led by an IT manager with considerable process experience and involved members from manufacturing, engineering, IT, finance, marketing, operations, and quality assurance. The director of design engineering was made process owner to provide oversight for all changes. The team spent nine months assessing the current way of working and proposed a new end-to-end NPD process. The reengineered NPD process included six subprocesses: ideation, business case development, project portfolio management, product development, product and process validation, and launch. The underlying information system was the enterprise system upgraded to include newer modules, which supported product life cycle management.

[1] Adapted from S. Balaji, C. Ranganathan, and T. Coleman, "IT-Led Process Reengineering: How Sloan Valve Redesigned Its New Product Development Process," *MIS Quarterly Executive* 10, no. 2 (June 2011), 81–92.

The quality, timing, and output of NPD greatly improved. The new NPD process reduced time-to-market to less than 12 months. New product ideas that were unlikely to work were filtered out early, eliminating problems of wasting resources. Synthesis of product and process information improved. Customer feedback was easier to access. And accountability increased, smoothing out responsibilities and workflow.

Not all IS enterprise system implementations are as successful as that at Sloan Valve. There are hundreds of stories of companies that ran into significant problems when automating and transforming their business processes, especially when an information system is at the heart of the change. Overstock.com's order tracking system failed for a full week when it rolled out a new enterprise system. By rushing to implement the new system, a glitch put the enterprise system out of sync with the accounting system, causing the company to have to restate more than five years of earnings, which showed lower revenue and higher losses. Clothing manufacturer Levi Strauss had similar problems with its new enterprise system, causing shipping errors and issues with its financial control systems. The latter was blamed for the company's 98% decrease in net income for the second quarter in 2008. Avis Europe attempted to implement an enterprise system, but project delays and cost overruns caused the company to cancel the project and write off £28 million on its books. With so much at risk, general managers must be informed and involved in these types of complex information systems that change business processes.[2]

IS can enable or impede business change. The right design coupled with the right technology can result in changes such as those experienced by Sloan Valve. The wrong business process design or the wrong technology, however, can force a company into operational, and sometimes financial, crisis as the Overstock.com, Levi Strauss, and Avis Europe examples show.

To a manager in today's business environment, an understanding of how IS enable business change is essential. The terms *management* and *change management* are used almost synonymously in today's business vocabulary: To manage effectively means to manage change effectively. As IS become ever more prevalent and more powerful, the speed and magnitude of the changes that organizations must address to remain competitive continue to increase. To be a successful manager, one must understand how IS enable change in a business; one must gain a process perspective of business and must understand how to transform business processes effectively. This chapter provides managers a view of business process change. It provides tools for analyzing how a company currently does business and for thinking about how to effectively manage the inevitable changes that result from competition and the availability of IS. This chapter also describes an IT-based solution commonly known as *enterprise IS*.

A brief word to the reader is needed. The term *process* is used extensively in this chapter. In some instances, it is used to refer to the steps taken to change aspects of the business. At other times, it is used to refer to the part of the business to be changed: the business process. The reader should be sensitive to the potentially confusing use of the term *process*.

Silo Perspective versus Business Process Perspective

When effectively linked with improvements to business processes, advances in IS enable changes that make it possible to do business in a new way, one that is better and more competitive than before. On the other hand, IS can also inhibit change, which occurs when managers fail to adapt business processes because they rely on inflexible systems to support those processes. Finally, IS can also drive change for better or for worse. Examples abound of industries that were fundamentally changed by advances in IS and of companies whose success or failure depended on the ability of their managers to adapt. This chapter considers IS as an enabler of business transformation, a partner in transforming business processes to achieve competitive advantages. We begin by comparing a process view of the firm with a functional view.

Transformation requires discontinuous thinking—recognizing and shedding outdated rules and fundamental assumptions that underlie operations. "Unless we change these rules, we are merely rearranging the deck chairs on the *Titanic*. We cannot achieve breakthroughs in performance by cutting fat or automating existing processes.

[2] Adapted from http://www.baselinemag.com/c/a/ERP/Five-ERP-Disasters-Explained-878312/ (accessed February 24, 2012).

Rather, we must challenge old assumptions and shed the old rules that made the business under perform in the first place."[3]

Functional (Silo) Perspective

Many think of business by imagining a hierarchical structure (described in Chapter 3) organized around a set of functions. Looking at a traditional organization chart allows an understanding of what the business does to achieve its goals. A typical hierarchical structure, organized by function, results in disconnected silos that might look like the one in Figure 5.1.

When an organization has silos, departments are organized on the basis of their core competencies. Specialized silos allow them to focus on what they do best. For example, the operations department focuses on operations, the marketing department focuses on marketing, and so on. Each major function within the organization usually forms a separate department to ensure that work is done by groups of experts in that function. This functional structure is widespread in today's organizations and is reinforced by business education curricula, which generally follow functional structures, that is, students take courses in functions (i.e., marketing, management, accounting) and major in functions and then are predisposed to think in terms of these same functions.

Even when companies use the perspective of the value chain model (as discussed in Chapter 2), they still focus on functions that deliver their portion of the process and "throwing it over the wall" to the next group on the value chain. These silos become self-contained functional units, which can be useful for several reasons. First, they allow an organization to optimize expertise and training. For example, all the marketing people can belong to the same department, allowing them to informally network and learn from each other. Second, the silos allow the organization to avoid redundancy in expertise by hiring one person who can be assigned to projects across functions on an as-needed basis instead of hiring an expert in each function. Third, with a silo organization, it is easier to benchmark outside organizations, utilize bodies of knowledge created for each function, and easily understand the role of each silo.

On the other hand, silo organizations can experience significant suboptimization. First, individual departments often recreate information maintained by other departments. Second, communication gaps between departments are often wide. Third, handoffs between silos are often a source of problems, such as finger-pointing and lost information. Finally, silos tend to lose sight of the objective of the overall organization and operate in a way that maximizes their local goals. The last point is illustrated by a production department that pushes the concept of a small number of product sizes or options while the marketing department urges management to consider a larger variety or highly customized products. Such conflicts do arise in many organizations, and it can be difficult to negotiate to find a solution that is best, overall, for the firm.

A firm's work changes over time. In a functionally organized silo business, each group is primarily concerned with its own set of objectives. The executive officers jointly seek to ensure that these functions work together to create value, but the task of providing the "big picture" to so many functionally oriented personnel can prove extremely challenging. As time passes and business circumstances change, new work is created that relies on more than one of the old functional departments. Departments that took different directions must now work together. They negotiate the terms of any new work processes with their own functional interests in mind, and the "big

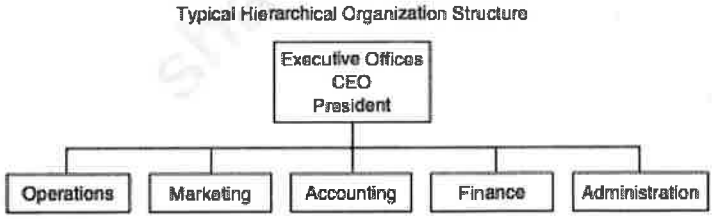

FIGURE 5.1 Hierarchical structure.

[3] Michael Hammer, "Reengineering Work: Don't Automate, Obliterate" *Harvard Business Review* 68, no. 4 (July–August 1990), 104–12.

picture" optimum gets scrapped in favor of suboptimal compromises among the silos. These compromises then become repeated processes; they become standard operating procedures.

Losing the big picture means losing business effectiveness. After all, a business's main objective is to create as much value as possible for its shareholders and other stakeholders by satisfying its customers to stimulate repeat sales and positive word of mouth. When functional groups duplicate work, fail to communicate with one another, or lose the big picture and establish suboptimal processes, the customers and stakeholders are not being well served.

Business Process Perspective

A manager can avoid such suboptimization—or begin to "fix" it—by managing from a business process perspective. A **business process perspective**, or more simply a **process perspective**, keeps the big picture in view and allows the manager to concentrate on the work that must be done to ensure the optimal creation of value. A process perspective helps the manager avoid or reduce duplicate work, facilitate cross-functional communication, optimize business processes, and ultimately, best serve the customers and stakeholders.

In business, a **process** is defined as an interrelated, sequential set of activities and tasks that turns inputs into outputs and includes the following:

- A beginning and an end
- Inputs and outputs
- A set of tasks (subprocesses or activities) that transform the inputs into outputs
- A set of metrics for measuring effectiveness

Metrics are important because they focus managers on the critical dimensions of the process. Metrics for a business process are things like **throughput**, which is how many outputs can be produced per unit time, or **cycle time**, which is how long it takes for an entire process to execute. Examples of process measures are the number of handoffs in the process or actual work versus total cycle time. Other metrics are based on the outputs themselves, such as customer satisfaction, revenue per output, profit per output, and quality of the output.

Examples of business processes include customer order fulfillment, manufacturing planning and execution, payroll, financial reporting, and procurement. A procurement process might look like the sample in Figure 5.2. The process has a beginning and an end, inputs (requirements for goods or services) and outputs (receipt of goods, vendor payment), and subprocesses (filling out a purchase order, verifying the invoice). Metrics of the success of the process might include turnaround time and the number of paperwork errors.

The procurement process in Figure 5.2 cuts across the functional lines of a traditionally structured business. For example, the requirements for goods might originate in the operations department based on guidelines from the finance department. Paperwork would likely flow through the administration department, and the accounting department would be responsible for paying the vendor.

Focusing on business processes ensures focusing on the business's goals (the "big picture") because each process has an "endpoint" that is usually a deliverable to a customer, supplier, or other stakeholder. A business process perspective recognizes that processes are often cross-functional. In the diagram in Figure 5.3, the vertical bars represent functional departments within a business. The horizontal bars represent processes that flow across those functional departments. A business process perspective requires an understanding that processes properly exist to serve the larger goals of the business and that functional departments must work together to optimize processes in regard to these goals.

FIGURE 5.2 Sample procurement business process.

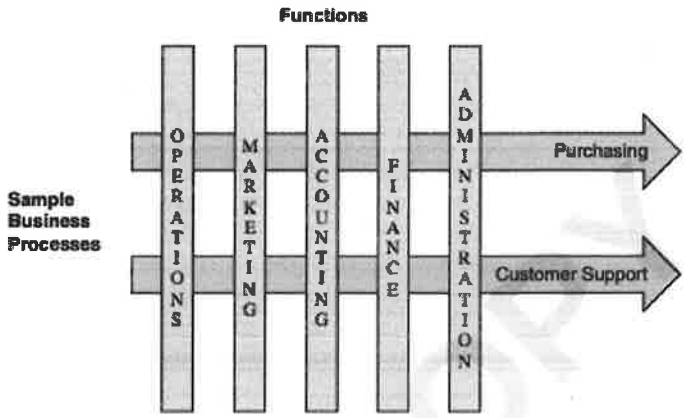

FIGURE 5.3 Cross-functional nature of business processes.

For example, an order-fulfillment process might include payment, order delivery, product implementation, and after-sales service tasks. This process would involve multiple functions, including operations, accounting, service, and sales, making it a cross-functional business process. The "sales order" would be the input for this process. A satisfied customer might be the output, and a number of metrics, such as a survey of the customer's satisfaction, time to complete the order fulfillment process, number of defects (or other quality measure), can be used to measure success.

When managers take a business process perspective, they are able to optimize the value that customers and stakeholders receive by managing the flow as well as the tasks. They begin to manage processes by:

- Identifying the customers of processes (who receives the output of the process?)
- Identifying these customers' requirements (what are the criteria for successful implementation of the process?)
- Clarifying the value that each process adds to the overall goals of the organization
- Sharing their perspective with other organizational members until the organization itself becomes more process focused

The differences between the silo and business process perspectives are summarized in Figure 5.4. **A silo perspective** refers to self-contained functional units such as marketing, operations, finance, and so on. Unlike a

	Silo Perspective	Business Process Perspective
Definition	Self-contained functional units such as marketing, operations, finance, and so on	Interrelated, sequential set of activities and tasks that turns inputs into outputs
Focus	Function	Cross-function
Goal Accomplishment	Goals optimized for the function, which may be suboptimal for the organization	Goals optimized for the organization, or the "big picture"
Benefits	Core competencies highlighted and developed; functional efficiencies	Avoidance of work duplication and cross-functional communication gaps; organizational effectiveness
Problems	Redundancy of information throughout the organization; cross-functional inefficiencies; communication difficulties	Difficulty in finding staff who can be knowledgeable generalists; need for sophisticated software

FIGURE 5.4 Comparison of silo perspective and business process perspective.

silo perspective, a business process perspective recognizes that businesses operate as a set of processes that flow across functional departments. The business process perspective enables a manger to analyze the processes of the business in regard to its larger goals in comparison to the functional orientation of the silo perspective. Finally, it provides a manager with insights into how those processes might better serve these goals.

An example illustrates the problem. Using a silo perspective, a customer with a warranty issue would need to explain a problem with a product to a customer service representative in the service department. If the problem is technical, the call would be transferred to a technical support person (in a different department), and the customer might need to explain the entire problem again. If the technical support representative determined that a part is needed, the customer would be transferred to the sales department and would need to explain the issue yet another time. Because the departments are not talking with one another, the customer might even need to provide proof of purchase several times to avoid having to pay for a warranty problem.

In contrast, with a business process perspective, either one representative would work with the customer on all problems or an **enterprise system** would enable the representative to transfer both the call and notes with the details to any specialists who are needed along the way. Having one representative handle all problems is not always possible because it is often difficult to find staff able to handle an entire process for the same reasons that support the functional hierarchical structure: People are normally trained in a function, such as marketing or accounting, not in a process that requires many different skill sets. For example, individuals who excel at marketing may not also possess the accounting skills needed to fix a billing problem.

Zara's Cross-Functional Business Processes

Consider Spanish clothing retailer Zara (introduced in Chapter 2). With over 1,600 stores in 78 countries around the world and a well-designed set of cross-functional business processes, Zara often is able to design, produce, and deliver a garment within 15 days. For this to happen, its managers must regularly create and rapidly replenish small batches of goods all over the world. Zara's organization, operational procedures, performance measures, and even its office layout are all designed to make information transfer easy.

Zara's designers are colocated with the production team, including marketing, procurement, and production planners. Prototypes are created nearby, facilitating easy discussion about the latest design. Large circular tables in the middle of the production process encourage impromptu meetings where ideas are readily exchanged among the designers, market specialists, and production planners. The speed and quality of the design process is greatly enhanced by the colocation of the entire team because the designers can quickly check their ideas with others on their cross-functional teams. For example, the market specialists can quickly respond to designs in terms of the style, color, and fabric whereas the procurement and production planners can update these specialists about manufacturing costs and available capacity.

Zara's information technology provides a platform but does not preclude informal face-to-face conversations. Retail store managers are linked to marketing specialists through customized handheld computers but sometimes use the telephone to share order data, sales trends, and customer reactions to a new style. Zara's cross-functional teams enable information sharing among everyone who "needs to know" and therefore creates the opportunity to change directions quickly to respond to new market trends.

Building Agile and Dynamic Business Processes

To stay competitive and consistently meet changing customer demands, organizations build **dynamic business processes** or **agile business processes**, processes that repeat through a constant renewal cycle of design, deliver, evaluate, redesign, and so on. Agile business processes are designed to simplify redesign and reconfiguration. They are designed to be flexible and easily adaptable to changes in the business environment and can be incrementally changed with little effort. Dynamic business processes, on the other hand, reconfigure themselves as they "learn" and the business utilizes them.

To be agile or dynamic, a process necessitates a high degree of IT use. The more of the process that can be done with software, the easier it is to change, and the more likely it can be designed to be agile or dynamic.

Examples of agile processes are often found in manufacturing operations, where production lines are reconfigured regularly to accommodate new products and technologies. For example, automobile production lines produce large numbers of vehicles, but very few are identical to the one made before or after it on the production line. Also, vehicles are often built with space and wiring for options (such as a remote starter) that can be added by a dealer quickly and with minimal labor. The design of the line is such that many changes in design, features, or options are just incorporated into the assembly of the vehicle at hand.

Another common example is in software development. Agile software development methodologies underlie an incremental and iterative development process that is often used to rapidly and collaboratively create working and relevant software.

More recently, with the use of the Internet and social technologies, building agility into business processes is increasingly common. Processes run entirely in the digital world. Some common examples are order management, service/product provisioning, human resource support, and bill payment. The pervasiveness of the digital world has necessitated rethinking many business processes; customers, employees, and other stakeholders expect to be able to access processes on the Web and perform self-service.

In fact, many processes have been designed as an app, as described in the Introduction. Consider smart phones or tablets. Each app loaded on these devices is, in reality, an automated business process. And because it's an app, it's relatively easy for the developer to upgrade, fix, and enhance. Apps are good examples of software that supports agile processes.

An example of a dynamic process is a network with a changing flow of data. The network could have sensors built in to monitor the flow, and when flow is greater than the current network configuration can handle, the network automatically redistributes or requisitions more capacity to handle the additional data and reconfigures itself to balance the flow over the new channels. Another example, with a more physical configuration, would be a call center. Call center systems are designed to monitor the flow of calls coming into a center and the time it takes for agents to respond to them. These systems can automatically redistribute calls to or from other centers as volume increases or decreases. The system might be sufficiently sophisticated so that it can add additional agents to the schedule or alert a supervisor of an increase and route calls to standby agents. Enabling the system to redistribute incoming calls to respond to changes in the center is an important capability.

Dynamic IT applications, a component of software defined architecture, described more fully in Chapter 6, are required for dynamic business processes. When the underlying IT is not designed with this goal in mind, the business process itself cannot adapt as necessary to changing requirements of the business environment. The benefits of agile and dynamic business processes are operational efficiency gained by the ease of incrementally improving the process as necessary and the ability to create game-changing innovative processes more quickly.

Sloan Valve's NPD process is another example of a more flexible approach. Previously steeped in the old way of doing things, and tied to legacy information systems, the redesigned NPD process was faster and enabled detection of and reaction to customer feedback, process problems, and team misalignments.

Changing Business Processes

Sloan Valve decided to do a complete redesign of its NPD process. After trying to incrementally change it with a new IS, and minor changes to the process, managers realized that a complete transformation was necessary.

Transforming a business today means redesigning business processes. Two techniques used to transform a static business process are: (1) radical process redesign, which is sometimes called **business process reengineering (BPR)** or simply reengineering and (2) incremental, continuous process improvement, which includes **total quality management (TQM)** and **Six Sigma**. Radical and incremental improvement concepts are important; they continue to be different tools a manager can use to effect change in the way his or her organization does business. The basis of both approaches is viewing the business as a set of business processes rather than using a silo perspective.

Incremental Change

At one end of the continuum, managers use incremental change approaches to improve business processes through small, incremental changes. This improvement process generally involves the following activities:

- Choosing a business process to improve
- Choosing a metric by which to measure the business process
- Enabling personnel to find ways to improve the business process based on the metric

Personnel often react favorably to incremental change because it gives them control and ownership of improvements and, therefore, renders change less threatening. The improvements grow from their grassroots efforts. TQM is one such approach that incorporates methods of continuous process improvement. At the core of the TQM method is W. Edwards Deming's "14 Points," or key principles to transform business processes. The principles outline a set of activities for increasing quality and improving productivity.[4] TQM has lost some of its luster in the United States, but it continues to be very popular in Europe and Asia.

Six Sigma is an incremental and data-driven quality management approach for eliminating defects from a process. The term *six sigma* comes from the idea that if the quality of all output from a process were to be mapped on a bell-shaped curve, the tail of the curve, six sigma (standard deviations) from the mean, would represent less than 3.4 defects per million. Such a low rate of defects would be close to perfect. The Six Sigma methodology is carried out by experts known as *Green Belts* and more experienced experts known as *Black Belts*, who have taken special Six Sigma training and worked on numerous Six Sigma projects. Motorola was one of the first companies in the United States to use Six Sigma, but GE made the method a part of its business culture driving significant and continuous improvement throughout the corporation. The GE Web site states "Six Sigma is a highly disciplined process that helps us focus on developing and delivering near-perfect products and services."[5]

Radical Change

Incremental change approaches work well for tweaking existing processes. However, they tend to be less effective for addressing cross-functional processes. Major changes usually associated with cross-functional processes require a different type of management tool. At the other end of the change continuum, radical change enables the organization to attain aggressive improvement goals (again, as defined by a set of metrics). The goal of radical change is to make a rapid, breakthrough impact on key metrics. Some businesses even have made radical process reconfiguration a core competency so that they can better serve customers whose demands are constantly changing.

Sloan Valve is an example of a company that set aggressive improvement goals and reached them with a radical change approach. The company set out to dramatically improve new products' time to market and was able to reduce it from 18–24 months to 12 months.

The difference in the incremental and radical approaches over time is illustrated by the graph in Figure 5.5. The vertical axis measures, in one sense, how well a business process meets its goals. Improvements are made either incrementally or radically. The horizontal axis measures time.

Not surprisingly, radical change typically faces greater internal resistance than does incremental change. Therefore, radical change processes should be carefully planned and used only when major change is needed in a short time. Some examples of situations requiring radical change are when the company is in trouble, when it imminently

[4] For more information about TQM and Deming's 14 Point approach to quality management, see the ASQ (Formerly known as the American Society for Quality), a global community of experts on quality and the administrators of the Malcolm Baldrige National Quality Award program, http://asq.org/learn-about-quality/total-quality-management/overview/overview.html (accessed August 26, 2015).

[5] http://www.ge.com/en/company/companyinfo/quality/whatis.htm (accessed August 27, 2015).

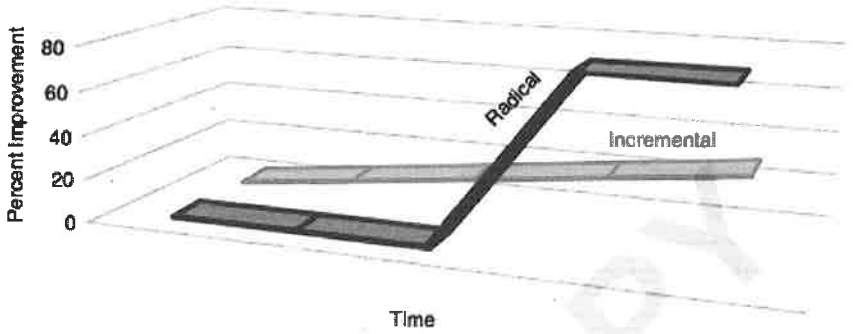

FIGURE 5.5 Comparison of radical and incremental improvement.

faces a major change in the operating environment, or when it must change significantly to outpace its competition. Key aspects of radical change approaches include the following:

- Need for major change in a short amount of time
- Thinking from a cross-functional process perspective
- Challenge to old assumptions
- Networked (cross-functional) organization
- Empowerment of individuals in the process
- Measurement of success via metrics tied directly to business goals and the effectiveness of new processes (e.g., production cost, cycle time, scrap and rework rates, customer satisfaction, revenues, and quality)

Workflow and Mapping Processes

Workflow in its most basic meaning is the series of connected tasks and activities performed by people and computers that together form a business process. Consideration of workflow is a way to assess a cross-functional process. But the term *workflow* has come also to mean software products that document and automate processes. Workflow software facilitates the design of business processes and creates a digital workflow diagram. workflow software lets the manager diagram answers to questions such as how a process will work, who will do what, what the information system will do, and what decisions will be made and by whom. When combined with business process management modules, processes can be managed, monitored, and modified.

The tool used to understand a business process is a **workflow diagram**, which shows a picture, or map, of the sequence and detail of each process step. More than 200 products are available for helping managers diagram the workflow. The objective of process mapping is to understand and communicate the dimensions of the current process. Typically, process engineers begin the process mapping procedure by defining the scope, mission, and boundaries of the business process. Next, engineers develop a high-level overview flowchart of the process and a detailed flow diagram of everything that happens in the process. The diagram uses active verbs to describe activities and identifies all process actors, inputs, and outputs. The engineers verify the detailed diagram for accuracy with the actors in the process and adjust it accordingly.

Business Process Management (BPM)

Thinking about the business as a set of processes has become more common, but managing the business as a set of processes is another story. Some claim that to have truly dynamic or agile business processes requires a well-defined

and optimized set of IT processes, tools, and skills called **business process management (BPM)**. In the 1990s, a class of systems to help manage workflows in the business emerged. The systems primarily helped track document-based processes where people executed the steps of the workflow. BPM systems go way beyond document management capabilities and include features that manage person-to-person process steps, system-to-system steps, and those processes that include a combination of them. Systems include process modeling, simulation, code generation, process execution, monitoring, and integration capabilities for both company-based and Web-based systems. The tools allow an organization to actively manage and improve its processes from beginning to end.

Enterprise Rent-a-Car, one of the largest car rental companies in the world with 7,000 locations and more than 65,000 employees worldwide, used BPM to model, manage, and streamline its IT-based processes. It used BPM to build Request Online, the system through which employees requested laptops, software and applications, system access, reports, and other services available from the IS department. The prior system was mostly manual, not scalable as volume increased, and not automatable. Not surprisingly, it was difficult to make improvements to that system. Using a BPM system, the IT staff developed a model that copied the way service requests were already handled so the experience would be familiar and added features slowly to enhance the experience. The result was a BPM-based system that provided better management capabilities and created a common platform for rapid change and capacity for future growth. That proved critical when Enterprise acquired National Car Rental and Alamo Rent A Car, creating much more demand for Request Online. Enterprise was able to shift development to less costly IT staff who could make process modifications directly through the BPM. Finally, the usability of the system was increased as the BPM facilitated the creation of customized interfaces based on characteristics of the specific users.[6]

BPM systems provide a way to build, execute, and monitor automated processes that may go across organizational boundaries. Some of the functionality of a BPM may be found in enterprise applications such as enterprise resource planning (ERP), customer relationship management (CRM), and financial software because these systems also manage processes within a corporation. But BPM systems go outside a specific application to help companies manage across processes. Some BPM systems manage front office applications that are often person-to-person processes such as sales or ordering. These processes are people centric and incorporate social IT. Other BPM systems support back-office processes that often are more system-to-system oriented and possibly extend outside the corporation to include Web-based components. See Figure 5.6 for a representative illustration of the components of a BPM system.

Enterprise's Request Online used a BPM system by Appian, which includes components to help a company design, manage, and optimize core business processes. Appian offers sophisticated features that combine social

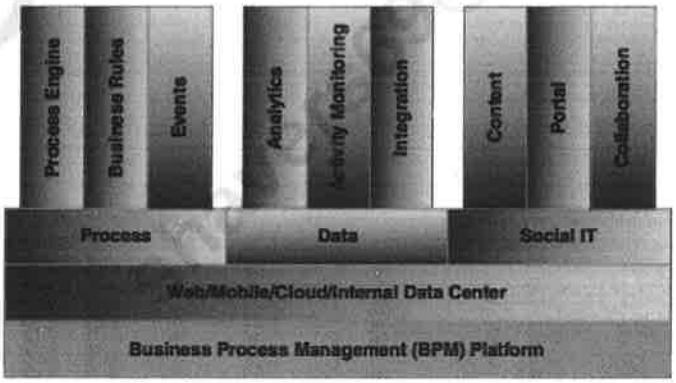

FIGURE 5.6 Sample BPM architecture.
Source: Adapted from www.appian.com (accessed May 1, 2012).

[6] Adapted from http://www.appian.com/about/news-item/enterprise-rent-car-goes-live-appian-enterprise/ (accessed August 27, 2015).

IT capabilities with process modeling, content management, data management, and integration with existing enterprise systems. Microsoft's SharePoint, one of the most popular collaboration environments, can be managed through Appian's suite, creating a one-stop-shop for managing business processes in an enterprise.

Two other common vendors for BPM are IBM and SoftwareAG's ARIS, which stands for architecture of integrated information systems. ARIS has also come to mean an entire modeling approach. ARIS structures four views of the enterprise, including an organizational view, a data view, a functional view, and a control view. Using ARIS, managers can model the business, including its processes, using a common language and set of procedures.

Integration versus Standardization

Processes are the ways organizations deliver goods and services to customers. Designing, building, and executing processes is one of the roles of management. Dr. Jeanne Ross, Principal Research Scientist at MIT's Center for Information Research, suggested that the level of integration and standardization of business processes, another management decision, determines the role of IS. Ross pointed out that "Companies make two important choices in the design of their operations: (1) how standardized their business processes should be across operational units (business units, region, function, market segment) and (2) how integrated their business processes should be across those units." The resulting model defines important IT and business capabilities (see the following figure). The level of process integration and standardization defines the necessary IS capabilities and ultimately the investment the firm will need to make in IS.

Process Integration versus Standardization

		Business Process Standardization	
		Low	High
Business Process Integration	High	The business is focused on process integration, usually creating a single face to customers and suppliers but does not usually impose process standards on operating units.	The business has a centralized design with high needs for reliability, predictability, and sharing data across business units, creating a single view of the process.
	Low	The business has a decentralized design with which business units make local decisions on processes to meet customer needs.	The business is focused on process standardization in which tasks are done the same way with the same systems across business units, but the business units have little need to interact.

CEMEX, the multinational cement company based in Monterrey, Mexico, built a business high in process standardization and low in process integration. CEMEX standardized on eight information systems-based business processes to cover logistics, manufacturing, accounting, planning, operations, procurement, finance, and HR. Each operating unit uses the same processes and creates similar data, but each runs autonomously, rarely sharing data. This approach provides a competitive advantage because it enables the company to grow quickly, easing the assimilation of acquired companies.

Merrill Lynch's Global Private Client business with high integration and low standardization provides a wide range of financial services to clients across multiple channels such as financial advisory services, online services, and help center support services. The key to the company's success is integration across processes to provide a single view of the customer, which can then be leveraged when new products and services are announced. At the same time, the company does not expect standardization across processes; each operating unit can create what it needs as long as it uses a standardized technology platform that supports the integrated design. That is, the separate systems need to coordinate the various information resources among themselves.

Source: J. Ross, "*Forget Strategy: Focus IT on Your Operating Model*," MIT Center for Information Research, Research Briefing (December 2005), V(3C), http://cisr.mit.edu/blog/documents/2005/12/09/2005_12_3c_operatingmodels.pdf/ (accessed May 23, 2015).

Enterprise Systems

Information technology is a critical component of almost every business process today because information flow is at its core. A class of IT applications called **enterprise systems** is a set of information systems tools that many organizations use to enable this information flow within and between processes across the organization. These tools help ensure integration and coordination across functions such as accounting, production, customer management, and supplier management. Some are designed to support a particular industry such as health care, retail, and manufacturing.

Computer systems in the 1960s and early 1970s were typically designed around a specific application. These early systems were often not connected with each other and often had their own version of data. One of the authors moved to another home in 1980 and visited the bank to change his address. He had to fill out a separate form for his checking and savings account. It was lucky that the post office forwarded mail for a year after the move; four months after moving, the bank sent a year-end auto loan summary document via his old address, requiring another update of the address, and nearly a year later, the bank sent his safe deposit box renewal form via his old address too, requiring yet another update. It was obvious that each system contained its own copy of redundant data and existed in its own silo.

Organizational computing groups faced the challenge of linking and maintaining the patchwork of loosely overlapping, redundant systems. In the 1980s and 1990s, software companies in a number of countries, including the United States, Germany, and the Netherlands, began developing integrated software packages that used a common database and cut across organizational systems. Some of these packages were developed from administrative systems (e.g., finance and human resources), and others evolved from materials resource planning (MRP) in manufacturing. These comprehensive software packages that incorporate all modules needed to run the operations of a business are called **enterprise information systems (EIS)** or simply *enterprise systems*. Enterprise systems include ERP, supply chain management (SCM), CRM, and product life cycle management (PLM) systems (see Figure 5.7). Some companies develop proprietary enterprise systems to support mission-critical processes when they believe these processes give them an advantage and using a vendor-supplied system would jeopardize that advantage. Other enterprise systems may be developed specifically to integrate organizational processes. Figure 5.8 describes some examples of the processes supported by an enterprise system.

Two of the largest vendors of enterprise systems are German-based SAP and California-based Oracle. Initially, SAP defined the ERP software space, and Oracle had the database system supporting it. But more recently, SAP has moved to its own database system, and Oracle has acquired many other smaller vendors, creating their own suite of enterprise software solutions.

Sloan Valve, the case introduced at the beginning of this chapter, used SAP. Initially, Sloan implemented the ERP module, but as the design emerged for the NPD process, the PLM module was key. It enabled the process owner to keep track of targets, look at efficiencies in the process, and understand process problems. It also helped track and allocate resources for each new product idea and enabled coordination between all the cross-functional team members.

Enterprise Resource Planning (ERP)

Enterprise resource planning (ERP) was designed to help large companies manage the fragmentation of information stored in hundreds of individual desktop, department, and business unit computers across the organization. These modules offered the IS department in many large organizations an option for switching from underperforming, obsolete mainframe systems to client-server environments designed to handle the changing business demands of their operational counterparts. Many firms moved from their troubled systems in the late 1990s to avoid the year 2000 (Y2K) problem[7] and to standardize processes across their businesses.

[7] The Y2K problem was of great concern in the 1990s because many old systems used two digits instead of four digits to represent the year, making it impossible to distinguish between years such as 2000 and 1900.

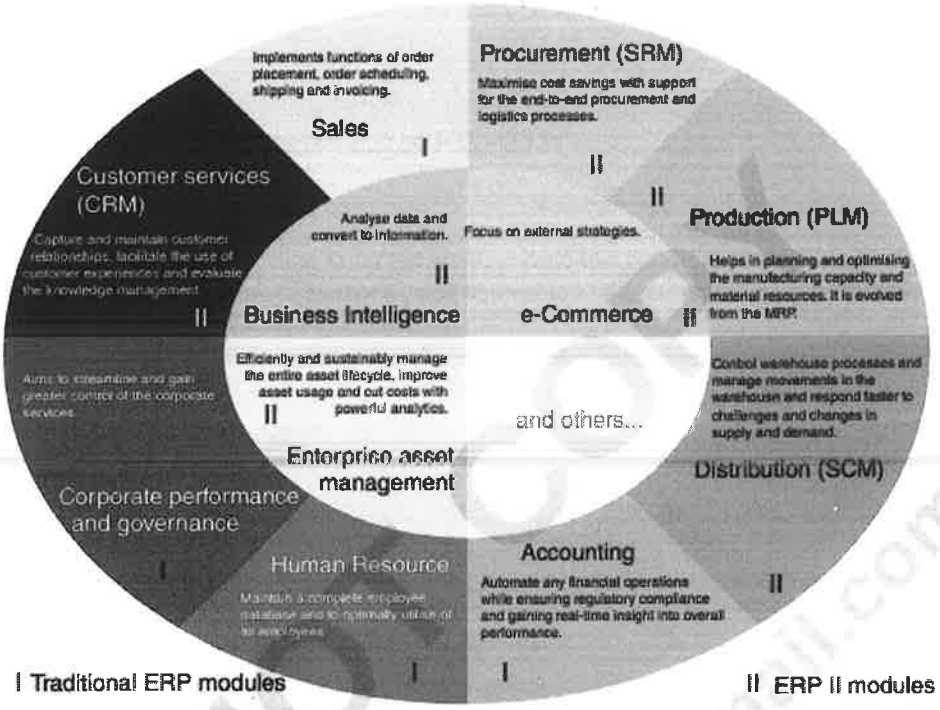

FIGURE 5.7 Enterprise systems and the processes they automate.
Source: Adapted from Shing Hin Yeung, http://commons.wikimedia.org/wiki/File:ERP_Modules.png (accessed August 27, 2015).

Enterprise System	Sample Processes
Enterprise resource planning (ERP)	Financial management (accounting, financial close, invoice to pay process, receivable management); human capital management (talent management, payrolls, succession planning); operations management (procurement, logistics, requisition invoice payment, parts inventory)
Customer relationship management (CRM)	Marketing (brand management, campaign management); lead management; loyalty program management; sales planning and forecasting; territory and account management; customer service and support (claims, returns, warranties)
Supply chain management (SCM)	Supply chain design; order fulfillment; warehouse management; demand planning, forecasting; sales and operations planning; service parts planning; source-to-pay/ procurement process; supplier life cycle management; supply contract management
Product life cycle management (PLM)	Innovation management (strategy and planning, idea capture and management, program/ project management); product development and management; product compliance management

FIGURE 5.8 Enterprise systems and examples of processes they support.

The next generation of enterprise system emerged: ERP II systems. Whereas an ERP makes company information immediately available to all departments throughout the company, ERP II also makes company information immediately available to *external stakeholders*, such as customers and partners. ERP II enables e-business by integrating business processes between an enterprise and its trading partners. More recently, a move to better manage information systems using the cloud has again called into question the design of some business processes.

Today, ERP systems include all of the ERP II functionality plus social and collaboration features. A good example is Chatter from Salesforce.com,[8] which includes an activity stream interface (similar to Facebook) for employees with easy connections to the firm's information in its ERP. SAP's ERP solution includes SAP ERP Financials, SAP ERP Human Capital Management, and SAP ERP Operations. Oracle's ERP solution, EnterpriseOne, offers these same functions. Both vendors have integrated their ERP solutions with their supply chain/logistics solutions, their CRM solutions, and several other modules that make them a one-stop shop for software that provides the backbone of an enterprise.

Characteristics of ERP Systems

ERP systems have several characteristics:[9]

- *Integration.* ERP systems are designed to seamlessly integrate information flows throughout the company. ERP systems are configured by installing various modules, such as:
  - Manufacturing (materials management, inventory, plant maintenance, production planning, routing, shipping, purchasing, etc.)
  - Accounting (general ledger, accounts payable, accounts receivable, cash management, forecasting, cost accounting, profitability analysis, etc.)
  - Human resources (employee data, position management, skills inventory, time accounting, payroll, travel expenses, etc.)
  - Sales (order entry, order management, delivery support, sales planning, pricing, etc.)
- *Packages.* ERP systems are usually commercial packages purchased from software vendors. Unlike many packages, ERP systems usually require long-term relationships with software vendors because the complex systems must typically be modified on a continuing basis to meet the organization's needs.
- *Best practices.* ERP systems reflect industry best (or at least "very good") practices for generic business processes. To implement them, businesses often have to change their processes in some way to accommodate the software.
- *Some assembly required.* The ERP system is software that needs to be integrated with the organization's hardware, operating systems, databases, and network. Further, ERP systems often need to be integrated with proprietary legacy systems. It often requires that **middleware** (software used to connect processes running in one or more computers across a network) or "bolt-on" systems be used to make all the components operational. Vendor-supplied ERP systems have a number of configurable components, too, which need to be set up to best fit with the organization. Rarely does an organization use an ERP system directly "out of the box" without configuration.
- *Evolving.* ERP systems were designed first for mainframe systems, then for client-server architectures, and now for Web-enabled or cloud-based delivery.

Integrating ERP packages with other software in a firm is often a major challenge. For example, integrating internal ERP applications with supply chain management software seems to create issues. Making sure the linkages between the systems happen seamlessly is a challenge. One important problem in meeting this challenge is to allow companies to be more flexible in sourcing from multiple (or alternative) suppliers while also increasing the transparency in tightly coupled supply chains. A second problem is to integrate ERP's transaction-driven focus into a firm's workflow.[10]

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[8] See http://www.salesforce.com/chatter/overview/ (accessed August 27, 2015).
[9] M. Lynne Markus and Cornelis Tanis, "The Enterprise System Experience—From Adoption to Success," *Framing the Domains of IT Management: Projecting the Future Through the Past*, ed. R. Zmud (Cincinnati, OH: Pinaflex Educational Resources, 2000), 176–79.
[10] Amit Basu and Akhil Kumar, "Research Commentary: Workflow Management Issues in e-Business," *Information Systems Research* 13, no. 1 (March 2002), 1–14.

Managing Customer Relationships

A type of software package that is increasingly considered an enterprise system is customer relationship management systems. **Customer relationship management (CRM)** is a set of software programs that supports management activities performed to obtain, enhance relationships with, and retain customers. They include sales, support, and service processes. Today, CRM has come to mean the enterprise systems that support these processes, and the term is used interchangeably with the set of activities.

CRM processes create ways to learn more about customers' needs and behaviors with the objective of developing stronger relationships. CRM systems consist of technological components as well as many pieces of information about customers, sales, marketing effectiveness, responsiveness, and market trends. Optimized CRM processes and systems can lead to better customer service, more efficient call centers, product cross-selling, simplified sales and marketing efforts, more efficient sales transactions, and increased customer revenues. The goal of CRM is to provide more effective interaction with customers and bring together all information the company has on a customer.

The top-selling CRM systems are from Salesforce.com, SAP, Oracle, and Microsoft Dynamics.[1] Oracle and SAP have CRM systems that integrate with their other enterprise systems. Oracle's CRM system includes modules for pricing, sales force automation, sales order management, support activities, customer self-service, and

Geographic Lens: Global vs. Local ERPs

ERP systems are usually designed around best practices—but whose best practices? SAP and Oracle, the leading vendors of ERP systems, have a Western bias. More specifically, best practices at the heart of their systems are based upon business processes that are found in successful companies in Germany and North America. However, when these systems are transplanted into Asian companies, problematic "misfits" have been found to occur.

An example is the use of ERP systems designed for hospitals. Western health care models are decidedly different from those used in Singapore. In Western countries, insurance enables patients to pay a fraction of their medical expenses themselves, and the government or private insurance covers the rest. Singapore has a completely different model. In Singapore, health care expenses are covered primarily by the individual. Government subsidies and other community support is minimal.

How does this affect processes embedded in ERP systems in hospitals? When ERP systems are designed for Western hospitals, they include modules that help manage the complexity of billing and collections that result from claims submissions and insurance verification. When the primary payment is from individuals paying at the time of service or in installments, the collections process is significantly different. Further, "bed class" is important in Singapore where patients in public hospitals can choose from a variety of plans ranging from one bed to six or more per room. The Western model is simpler because single-bed rooms are more common.

Because of differences and "misfits," businesses in many non-Western companies are turning to local vendors that have developed systems reflecting local best practices. For example, local ERP vendors in Taiwan have developed ERP systems to support the majority of firms in the market space—small- to medium-sized Taiwanese companies with sophisticated, adaptive logistic networks. The local ERP vendors have adopted a strategy of customization and are more willing to modify their systems to satisfy local needs than are their large global competitors.

These examples suggest that another factor needs to be considered when designing and implementing and ERP: It should not be implemented if the system is based on a cultural model that conflicts with the local customs and that cannot easily be accommodated.

Sources: C. Soh, S. K. Sia, and J. Tay-Yap, "Cultural Fits and Misfits: Is ERP a Universal Solution," *Communications of the ACM* 43, no. 4 (2000), 47–51; E. T. G. Wang, G. Kleing, and J. J. Jiang, "ERP Misfit: Country of Origin and Organizational Factors," *Journal of Management Information Systems* 23, no. 1 (2006), 263–92.

[1] Louis Columbus, "Gartner CRM Market Share Update: 41% Of CRM Systems Are SaaS-based, Salesforce Dominating Market Growth," *Forbes*, May 6, 2014, http://www.forbes.com/sites/louiscolumbus/2014/05/06/gartners-crm-market-share-update-shows-41-of-crm-systems-are-saas-based-with-salesforce-dominating-market-growth/ (accessed August 27, 2015).

service management. SAP's CRM system has similar modules plus marketing support such as resource and brand management, campaign management, real-time offer management, loyalty management, and e-marketing. There is also an e-commerce module that facilitates personalized interface and self-service applications for customers. Salesforce.com is a different type of CRM. Whereas Oracle and SAP came from the enterprise systems space and then created a CRM module, Salesforce.com started with a CRM solution. In addition, the products by Oracle and SAP grew from on-premise enterprise systems, and each company eventually built Web-based versions of its products, but Salesforce.com started as a Web-based cloud system. Managers who seek a CRM system for their organizations should compare the features and delivery systems of these and other solutions provided by niche vendors who specialize in systems optimized for specific industry applications.

Social IT is increasingly integrated into CRM solutions. Providing software or Web applications that extend the brand, engage customers, allow customers to interact with each other and with employees, and provide service options generates additional "touches" with customers. CRM systems record these touches. The information becomes an additional channel of data useful for building customer relationships. Salesforce.com teamed with Dun & Bradstreet to use Data.com, a cloud-based storehouse of company and customer contact information for use in CRM systems. Data.com uses a crowd-sourcing model to collect up-to-date information with users of the server contributing data and helping to keep that data accurate.

In Chapter 1, we described the Ritz-Carlton's CRM, Class, which captures information about guest preferences and enables the chain to provide enhanced, customized service during future visits. Web sites collect information from customers who visit, make purchases, or request information. That information is stored in the company's CRM and used in many ways to better meet customer needs and enhance the customer experience. For example, movie site Netflix stores all the purchases and product reviews a customer makes in its CRM. Using that information, the site recommends additional films the customer might enjoy based on analysis of the data in the CRM.

Managing Supply Chains

Another type of enterprise system in common use is a **supply chain management (SCM)** system, which manages the integrated supply chain. Business processes are not just internal to a company. With the help of information technologies, many processes are linked across companies with a companion process at a customer or supplier, creating an integrated supply chain. Technology, especially Web-based technology, allows the supply chains of a company's customers and suppliers to be linked through a single network that optimizes costs and opportunities for all companies in the supply chain. By sharing information across the network, guesswork about order quantities for raw materials and products can be reduced, and suppliers can make sure they have enough on hand if demand for their products unexpectedly rises.

The supply chain of a business is the process that begins with raw materials and ends with a product or service ready to be delivered (or in some cases actually delivered) to a customer. It typically includes the procurement of materials or components, the activities to turn these materials into larger subsystems or final products, and the distribution of these final products to warehouses or customers. But with the increase in information systems use, the supply chain may also include product design, product planning, contract management, logistics, and sourcing. Globalization of business and ubiquity of communication networks and information technology have enabled businesses to use suppliers from almost anywhere in the world. At the same time, this has created an additional level of complexity for managing the supply chain. *Supply chain integration* is the approach of technically linking supply chains of vendors and customers to streamline the process and to increase efficiency and accuracy.

Without such linking, a temporary increase in demand from a retailer might become interpreted by its suppliers as permanent, and the changes can become magnified by each supplier up the chain when each supplier attempts to add another percent or two just to be "safe." Those erratic and wild changes are called the *bullwhip effect*. Linking synchronizes all suppliers to the same demand increase up and down the chain and prevents that effect.

Integrated supply chains have several challenges, primarily resulting from different degrees of integration and coordination among supply chain members.[12] At the most basic level, there is the issue of information integration. Partners must agree on the type of information to share, the format of that information, the technological standards they both use to share it, and the security they use to ensure that only authorized partners access it. Trust must be established so the partners can solve higher-level issues that may arise. At the next level is the issue of synchronized planning. At this level, the partners must agree on a joint system of planning, forecasting, and replenishment. The partners, having already agreed on what information to share, now have to agree on what to do with it. The third level can be described as workflow coordination—the coordination, integration, and automation of critical business processes between partners. For some supply chains, this might mean simply using a third party to link the procurement process to the preferred vendors or to communities of vendors who compete virtually for the business. For others, it might be a more complex process of integrating order processing and payment systems. Ultimately, supply chain integration leads to new business models as varied as the visionaries who think them up. These business models are based on new ideas of coordination and integration made possible by the Internet and information-based supply chains. In some cases, new services have been designed by the partnership between supplier and customer, such as new financial services offered when banks link up electronically with businesses to accept online payments for goods and services purchased by the businesses' customers. In other cases, a new business model for sourcing has resulted, such as one in which companies list their supply needs and vendors electronically bid to be the supplier for that business.

Demand-driven supply networks are the next step for companies with highly evolved supply chain capabilities. Kimberly Clark, the 135-year-old consumer products company, is one such example. Its vision is for a highly integrated suite of supply chain systems that provide end-to-end visibility of the supply processes in real time. Key processes in the company's demand-driven supply network are forecast to stock and order to cash. Using an integrated suite of systems allows the firm's users to share the same information as close to real time as possible and to use the data in their systems for continually updating their supply chain, category management, and consumer insight processes. IS have allowed managers to reduce the problems of handing off data from one system or process to another (because now everything is in one system), having employees work from different databases (because it's now one database), and working with old data (because it's as real time as possible). This has improved managers' ability to see what's going on in the marketplace and evaluate the impact of promotions, production, and inventory much more quickly.

Integrated supply chains are truly global in nature. Thomas Friedman, in his book *The World is Flat*, describes how the Dell computer that he had ordered for writing his book was developed from the contributions of an integrated supply chain that involved about four hundred companies in North America, Europe, and, primarily, Asia. However, the globalization of integrated supply chains faces a growing challenge from skyrocketing transportation costs. For example, Tesla Motors, a pioneer in electric-power cars, had originally planned the production of a luxury roadster for the U.S. market based on an integrated global supply chain. The 1,000-pound battery packs for the cars were to be manufactured in Thailand, shipped to Britain for installation, and then shipped to the United States where they would be assembled into cars. However, because of the extensive costs associated with shipping the batteries more than 5,000 miles, Tesla decided to make the batteries and assemble the cars near its headquarters in California. Darryl Siry, Tesla's Senior Vice President of Global Sales, Marketing, and Service explains: "It was kind of a no-brain decision for us. A major reason was to avoid the transportation costs, which are terrible." Economists warn managers to expect the "neighborhood effect" in which factories may be built closer to component suppliers and consumers to reduce transportation costs. This effect may apply not only to cars and steel but also to chickens and avocados and a wide range of other items.[13]

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[12] Hau Lee and Seungjin Whang, "E-Business and Supply Chain Integration," Stanford University Global Supply Chain Management Forum (November 2001).

[13] Larry Rohter, "Shipping Costs Start to Crimp Globalization" *The New York Times*, 1, 10, http://www.nytimes.com/2008/08/03/business/worldbusiness/03global.html (accessed August 27, 2015).

Dell continues to be not only a great example of an integrated supply chain but also of the neighborhood effect. Its "build-to-order" strategy of building computers as they are ordered rather than to mass-produce them for inventory requires an integrated supply chain. One of the authors of this textbook visited a Dell plant in Malaysia with several dozen students. An official there described how the plant's zero inventory goal was accomplished by ordering components only when computers were ordered, to arrive on the day of assembly. Also, suppliers were strategically located in adjacent buildings surrounding the plant with an airport practically in walking distance. In this way, suppliers are closely linked with the actual production process.

Product Life Cycle Management (PLM)

A less well-known type of enterprise system is a **product life cycle management (PLM)** system. PLM systems automate the steps that take ideas for products and turn them into actual products. *PLM* refers to the process that starts with the idea for a product and ends with the "end of life" of a product. It includes the innovation activities, new product development, and management, design, and product compliance (if necessary). PLM systems contain all the information about a product such as design, production, maintenance, components, vendors, customer feedback, and marketing.

Advantages and Disadvantages of Enterprise Systems

One major benefit of enterprise systems is that they represent a set of industry best practices. One confidential story relayed to the authors described a large university that had suffered for years with inconsistent, incomplete, and immature processes. The university's leader announced in advance that rather than customize a new ERP to fit those processes, the directive was to replace completely those poor processes provided by the ERP. As a result, the ERP's best practices dramatically improved the university's ability to provide information services to faculty, staff, and students and also to track the entire "life cycle" of people from initial inquiry to graduation and beyond.

Another major benefit of an enterprise system is that all modules of the information system easily communicate with each other, offering enormous efficiencies over stand-alone systems. In business, information from one functional area is often needed by another area. For example, an inventory system stores information about vendors who supply specific parts. This same information is required by the accounts payable system, which pays vendors for their goods. It makes sense to integrate these two systems to have a single accurate record of vendors and to use an enterprise system to facilitate that integration.

Because of the focus on integration, enterprise systems are useful tools for an organization seeking to centralize operations and decision making. As described earlier in the Integration versus Standardization box about the Ross framework, high integration allows units to coordinate easily and unify their data for global access. Redundant data entry and duplicate data may be eliminated; standards for numbering, naming, and coding may be enforced; and data and records can be cleaned up through standardization. Further, the enterprise system can reinforce the use of standard procedures across different locations.

The obvious benefits notwithstanding, implementing an enterprise system represents an enormous amount of work. For example, if an organization has allowed both the manufacturing and the accounting departments to keep their own records of vendors, then most likely these records are kept in somewhat different forms (one department may enter the vendor name as IBM, the other as International Business Machines or even IBM Corp., all of which make it difficult to integrate the databases). Making matters worse, a simple data item's name itself might be stored differently in different systems. In one system, it might be named Phone_No, but in another, it might be simply Phone. Such inconsistencies in data items and values must be recognized and fixed so that the enterprise system can provide optimal advantage.

Moreover, even though enterprise systems are flexible and customizable to a point, most also require business processes to be redesigned to achieve optimal performance of the integrated modules. It is rare that an off-the-shelf system is perfectly harmonious with an existing business process; the software usually requires significant modification or customization to fit with the existing processes, or the processes must change to fit the software.

In most installations of enterprise systems, both take place. The system is usually customized when it is installed in a business by setting a number of parameters. Many ERP projects are massive undertakings, requiring formal, structured project management tools (as discussed in Chapter 11).

All systems make assumptions about how the business processes work, and at some level, customization is not possible. For example, one major Fortune 500 company refused to implement a vendor's enterprise system because the company manufactured products in lots of "one," and the vendor's system would not handle the volume this company generated. If the company had decided to use the ERP, a complete overhaul of its manufacturing process in a way that executives were unwilling to do would have been necessary.

Implementing enterprise systems requires organizations to make changes beyond just the processes, but also in their organization structure. Recall from Chapter 1 that the Information Systems Strategy Triangle suggests that implementing an information system must be accompanied with appropriate organizational changes to be effective. Implementing an enterprise system is no different; a 2014 Panorama report stated directly that only firms that allocate enough of the project budget to organizational change management will achieve the best results.[14] For example, who will now be responsible for entering the vendor information that was formerly kept in two locations? How will that information be entered into the enterprise system? The answer to such simple operational questions often requires managers minimally to modify business processes and more likely to redesign them completely to accommodate the information system.

Enterprise systems are also risky. The number of enterprise system horror stories demonstrates this risk. For example, Kmart wrote off its $130 million ERP investment. American LaFrance (ALF), the manufacturer of highly customized emergency vehicles, declared bankruptcy, blaming its IT vendor and its ERP implementation. The problems with the implementation kept ALF from being able to manufacture many preordered vehicles.[15] Two months after the installation of a new ERP system, the Fort Worth Police Officers Association complained that paychecks were not being received correctly or on a timely basis by officers. Some officers had not been paid since the installation, and others were shortchanged in their paychecks because the new system was not able to handle odd hours and shift work.

Furthermore, enterprise systems and the organizational changes they induce tend to come with a hefty price tag. In a study of the initial acquisition and implementation costs of ERP systems in primarily midsize companies (with $100 million to $1 billion in annual revenues), half of the responding 157 chief financial officers (CFOs) admitted spending *more than* $1 million for the license, service, and first year's maintenance on their current ERP systems. Nine of 10 respondents said they spent a minimum of $250,000. Unreported were additional hidden costs in the form of technical and business changes, likely to be necessary when implementing an enterprise system. These include project management, user training, and IT support costs.[16] Some surveys uncover negative impacts on performance. For instance, in 2014, overruns in costs were found to plague 54% of ERP projects, and 72% of the firms reporting encountered implementation delays. Perhaps more important were disruptions in service such as difficulties in shipping products, experienced by 51% of the firms surveyed.[17]

One of the reasons that ERP systems are so expensive is that they are sold as a suite, such as financials or manufacturing, and not as individual modules. Because buying modules separately is difficult, companies implementing ERP software often find the price of modules they won't use hidden in the cost of the suite.

Seventy percent of survey respondents report that they are satisfied with their ERP systems in spite of the large expense, overruns, delays, and disruptions experienced, largely due to the capabilities of ERP systems. However, only 63% considered the project a "success," perhaps due to overruns.[18] A set of advantages and disadvantages of enterprise systems is provided in Figure 5.9.

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[14] Panorama Consulting, "Organizational Issues Number One Reason for Extended Durations," http://panorama-consulting.com/company/press-releases/panorama-consulting-solutions-releases-2014-erp-report/ (accessed February 26, 2015).

[15] For additional examples of IT failures in general and enterprise systems failures in particular, please visit the blog written by Michael Krigsman, http://blogs.zdnet.com/projectfailures/.

[16] T. Wailgum, "Why CEOs and CFOs Hate It: ERP" (April 8, 2009), http://advice.cio.com/thomas_wailgum/why_cfos_and_ceos_hate_it_erp (accessed February 14, 2012).

[17] Panorama Consulting 2014 Report.

[18] Ibid.

Advantages	Disadvantages
• Represent "best practices" • Allow modules throughout the organization to communicate with each other • Enable centralized decision making • Eliminate redundant data entry • Enable standardized procedures in different locations	• Require enormous amount of work • Require redesign of business practices for maximum benefit • Have very high cost • Are sold as a suite, not individual modules • Require organizational changes • Have high risk of failure

FIGURE 5.9 Advantages and disadvantages of enterprise systems.

When the System Drives the Transformation

When is it appropriate to use the enterprise system to drive transformation and business process redesign, and when is it appropriate to redesign the process first and then implement an enterprise system? Although it may seem like the process should be redesigned first and then the information system aligned to the new design, there are times when it is appropriate to let the enterprise system drive business process redesign. First, when an organization is just starting out and processes do not yet exist, it is appropriate to begin with an enterprise system as a way to structure operational business processes. After all, most processes embedded in the "plain vanilla" enterprise system from a top vendor are based on the best practices of corporations that have been in business for years. Second, when an organization does not rely on its operational business processes as a source of competitive advantage, then using an enterprise system to redesign these processes is appropriate. Third, it is reasonable when the current systems are in

Social Business Lens: Crowdsourcing Changes Innovation Processes

One business process that has been radically changed by the use of social IT is the way innovation is managed using crowdsourcing. Enterprises have found ways to use a social IT platform to solicit, discuss, and prioritize new ideas. Anyone in the community can add an idea, and then the entire community can discuss, comment on, and rate the idea. Managers then have a wealth of ideas along with community input to use as input into the innovation process.

One of the original examples of this is Dell's Ideastorm. Anyone in the community can access Ideastorm to view ideas posted by the community, post an idea for Dell products or services, vote on the ideas presented, and see what Dell managers have decided to do with the ideas presented. Ideas presented by the community range from suggestions for new features on existing systems to new products and services Dell might offer. By allowing the community to comment and vote on ideas, managers get a sense of the importance and viability of implementing the innovation.

Similar social platforms have been implemented by numerous other companies including Starbucks' mystarbucksidea.com and Best Buy's IdeaX. Companies have also taken this idea inside the corporation to solicit ideas and innovations about processes, products, and other enterprise issues. Dell's EmployeeStorm and the City of New York's Simplicity are two social IT examples of soliciting ideas to improve processes and efficiencies from employees.

Companies have also embraced the crowd for individual projects; Sam Adams, the beer company, used a Facebook application for crowdsourcing the next flavor of beer. The application let fans select the color, clarity, body, malt, hops, and yeast components of a recipe. For each component, the crowdsourcing application educated fans about the contribution each component made to the resulting beer. The company collected the crowd's preferences, sharing them along the way for comment and discussion. The results not only gave Sam Adams managers information about preferences of their fans but also prioritized ideas about the next product to create with a high probability that it will have a large fan base to get it started.

Sources: https://gigaom.com/2011/01/19/new-york-city-crowdsourcing/ (accessed August 27, 2015); http://www.facebook.com/SamuelAdams?sk=app_299970113373932 (accessed January 19, 2012); http://www.ideastorm.com (accessed on August 30, 2015).

crisis and there is not enough time, resources, or knowledge in the firm to fix them. Even though it is not an optimal situation, managers must make tough decisions about how to fix the problems. A business must have working operational processes; therefore, using an enterprise system as the basis for process design may be the only workable plan. It was precisely this situation that many companies faced with Y2K.

Likewise, it is sometimes inappropriate to let an enterprise system drive business process change. When an organization derives a strategic advantage through its operational business processes, it is usually not advisable for it to buy a vendor's enterprise system. Using a standard, publicly available information system that both the company and its competitors can buy from a vendor may mean that any system-related competitive advantage is lost. For example, consider a major computer manufacturer that relied on its ability to process orders faster than its competitors to gain strategic advantage. Adopting an enterprise system's approach would result in a loss of that advantage. Furthermore, the manufacturer might find that relying on a third party as the provider of such a strategic system would be a mistake in the long run because any problems with the system due to bugs or changed business needs would require negotiating with the ERP vendor for the needed changes. With a system designed in house, the manufacturer was able to ensure complete control over the IS that drives its critical processes.

Another situation in which it would be inappropriate to let an enterprise system drive business process change is when the features of available packages and the needs of the business do not fit. An organization may use specialized processes that cannot be accommodated by the available enterprise systems. For example, many ERPs were developed for discrete part manufacturing and do not support some processes in paper, food, or other process industries.[39]

A third situation would result from lack of top management support, company growth, a desire for strategic flexibility, or decentralized decision making that render the enterprise system inappropriate. For example, Dell stopped the full implementation of SAP R/3 after only the human resources module had been installed because the CIO did not think that the software would be able to keep pace with Dell's extraordinary growth. Enterprise systems were also viewed as culturally inappropriate at the highly decentralized Kraft Foods.

Challenges for Integrating Enterprise Systems Between Companies

With the widespread use of enterprise systems, the issue of linking supplier and customer systems to the business's systems brings many challenges. As with integrated supply chains, there are issues of deciding what to share, how to share it, and what to do with it when the sharing takes place. There are also issues of security and agreement on encryption or other measures to protect data integrity as well as to ensure that only authorized parties have access.

Some companies have tried to reduce the complexity of this integration by insisting on standards either at the industry level or at the system level. An example of an industry-level standard is the bar coding used by all who do business in the consumer products industry. An example of a system-level standard is the use of SAP or Oracle to provide the ERP system used by both supplier and customer. And the increasing use of cloud-based systems with standard interfaces makes the integration easier.

SUMMARY

- Most business processes today have a significant information systems component to them. Either the process is completely executed through software or an important information component complements the physical execution of the process. Transforming business, therefore, involves rethinking the information systems that support business processes.
- IS can enable or impede business process change. IS enables change by providing both the tools to implement the change and the tools on which the change is based. IS can impede change, particularly when the process flow is mismatched with the capabilities of the IS.
- To understand the role IS plays in business transformation, one must take a business process rather than a functional (silo) perspective. Business processes are well-defined, ordered sets of tasks characterized by a beginning and an end,

[39] Markus and Tanis, "The Enterprise System Experience," 176–79.

sets of associated metrics, and cross-functional boundaries. Most businesses operate business processes even if their organization charts are structured by functions rather than by processes.

- Agile business processes are processes that are designed to be easily reconfigurable. Dynamic processes are designed to automatically update themselves as conditions change. Both types of processes require a high degree of information systems, which makes the task of changing the process a software activity rather than a physical activity.
- Making changes in business processes typically involves either incremental or radical change. Incremental change with TQM and Six Sigma implies an evolutionary approach. Radical change with a BPR approach, on the other hand, is more sudden. Either approach can be disruptive to the normal flow of the business; hence, strong project management skills are needed.
- BPM systems are used to help managers design, control, and document business processes and ultimately the workflow in an organization.
- An enterprise system is a large information system that provides the core functionality needed to run a business. These systems are typically implemented to help organizations share data between divisions. However, in some cases, enterprise systems are used to effect organizational transformation by imposing a set of assumptions on the business processes they manage.
- An ERP system is a type of enterprise system used to manage resources including financial, human resources, and operations.
- A CRM system is a type of enterprise system used to manage the processes related to customers and the relationships developed with customers.
- An integrated supply chain is often managed using an SCM system, an enterprise system that crosses company boundaries and connects vendors and suppliers with organizations to synchronize and streamline planning and deliver products to all members of the supply chain.
- A PLM system is a type of enterprise system support product development from its first idea up through its end.
- Information systems are useful as tools to both enable and manage business transformation. The general manager must take care to ensure that consequences of the tools themselves are well understood and well managed.

KEY TERMS

agile business processes (p. 104)
business process management (BPM) (p. 107)
business process perspective (p. 102)
business process reengineering (BPR) (p. 105)
customer relationship management (CRM) (p. 113)
cycle time (p. 102)
dynamic business processes (p. 104)
Enterprise Information Systems (EIS) (p. 110)
enterprise resource planning (ERP) (p. 110)
enterprise systems (p. 110)
middleware (p. 112)
process (p. 102)
process perspective (p. 102)
product life cycle management (PLM) (p. 116)
silo perspective (p.103)
Six Sigma (p. 105)
supply chain management (SCM) (p. 114)
throughput (p. 102)
total quality management (TQM) (p. 105)
workflow (p. 107)
workflow diagram (p. 107)

DISCUSSION QUESTIONS

1. Why was radical design of business processes embraced so quickly and so deeply by senior managers of so many companies? In your opinion, and using hindsight, was its popularity a benefit for businesses? Why or why not?
2. Off-the-shelf enterprise IS often forces an organization to redesign its business processes. What are the critical success factors to make sure the implementation of an enterprise system is successful?
3. ERP systems are usually designed around best practices. But whose best practices are the right ones? A Western bias is common; practices found in North America or Europe are often the foundation. When transferred to Asia, however, the

resulting systems may be problematic. Why do you think this is the case? What might be different in the way different countries use processes (besides the standard "language" difference)?

4. Have you been involved with a company doing a redesign of its business processes? If so, what were the key things that went right? What went wrong? What could have been done better to minimize the risk of failure?

5. What do you think the former CIO of Dell, Jerry Gregoire, meant when he said, "Don't automate broken business processes"?[28]

6. What might an integrated supply chain look like for a financial services company such as an insurance provider or a bank? What are the components of the process? What would the customer relationship management process look like for this same firm?

7. Tesco, the U.K. retail grocery chain, used its CRM system to generate annual incremental sales of £100 million. Using a frequent shopper card, a customer got discounts at the time of purchase, and the company got information about the customer's purchases, creating a detailed database of customer preferences. Tesco then categorized customers and customized discounts and mailings, generating increased sales and identifying new products to expand the organization's offerings. At the individual stores, data showed which products must be priced below competitors, which products had fewer price-sensitive customers, and which products must have regular low prices to be successful. In some cases, prices were store specific, based on the customer information. The information system has enabled Tesco to expand beyond groceries to books, DVDs, consumer electronics, flowers, and wine. The chain also offers services such as loans, credit cards, savings accounts, and travel planning. What can Tesco management do now that the company has a CRM that it could not do prior to the CRM implementation? How does this system enable Tesco to increase the value provided to customers?

■ CASE STUDY 5-1 Santa Cruz Bicycles

Bicycle enthusiasts not only love the ride their bikes provide but also are often willing to pay for newer technology, especially when it will increase their speed or comfort. Innovating new technologies for bikes is only half the battle for bike manufacturers. Designing the process to manufacture the bikes is often the more daunting challenge.

Consider the case of Santa Cruz Bicycles. It digitally designs and builds mountain bikes and tests them under the most extreme conditions to bring the best possible product to its customers. A few years back, the company designed and patented the Virtual Pivot Point (VPP) suspension system, a means to absorb the shocks that mountain bikers encounter when on the rough terrain of the off-road ride. One feature of the new design allowed the rear wheel to bounce 10 inches without hitting the frame or seat, providing shock absorption without feeling like the rider was sitting on a coiled spring.

The first few prototypes did not work well; in one case, the VPP joint's upper link snapped after a quick jump. The experience was motivation for a complete overhaul of the design and engineering process to find a way to go from design to prototype faster. The 25-person company adopted a similar system used by large, global manufacturers: product life cycle management (PLM) software.

The research and development team had been using computer-aided-design (CAD) software, but it took seven months to develop a new design, and if the design failed, starting over would be the only solution. This design approach was a drain not only on the company's time but also on its finances. The design team found a PLM system that helped members analyze and model capabilities in a much more robust manner. The team used simulation capabilities to watch the impact of the new designs on rough mountain terrain. The software tracks all the variables the designers and engineers need so they can quickly and easily make adjustments to the design. The new system allows the team to run a simulation in a few minutes, representing a very large improvement over their previous design software, which took seven hours to run a simulation.

The software was just one component of the new process design. The company also hired a new master frame builder to build and test prototypes in house and invested in a van-size machine that can fabricate intricate parts for the prototypes, a process the company previously outsourced. The result was a significant decrease in its design-to-prototype process. What once averaged about 28 months from start of design to shipping of the new bike now takes 12 to 14 months.

[28] "Technology: How Much? How Fast? How Revolutionary? How Expensive?" *Fast Company* 56, no. 62, http://www.fastcompany.com/online/56/fasttalk.html (accessed May 30, 2002).