

CHAPTER 7

PROCESS MODELING, PROCESS IMPROVEMENT, AND ERP IMPLEMENTATION

LEARNING OBJECTIVES

After completing this chapter, you will be able to:

- Use basic flowcharting techniques to map a business process
- Develop an event process chain (EPC) diagram of a basic business process
- Evaluate the value added by each step in a business process
- Develop process-improvement suggestions
- Discuss the key issues in managing an ERP implementation project
- Describe some of the key tools used to manage an ERP implementation project

INTRODUCTION

The theme of business processes management underlies much of the discussion in this text. In this chapter, we will explore tools, such as flowcharts and process chains, that can be used to describe business processes. You will learn how these tools, which are not specific to ERP, can help managers identify process elements that need to be improved. We will finish by studying the role these process-modeling tools play in ERP implementation projects.

PROCESS MODELING

By now, it should be clear that business processes can be quite complex. Adding to that complexity is the fact that individuals with various skills and abilities are responsible for executing business processes. For business processes to be effective (achieve the desired results) and efficient (achieve the desired results with the minimum use of resources), the processes must be clearly defined, and individuals must be adequately trained to perform their roles and to understand how their roles fit within the overall business process.

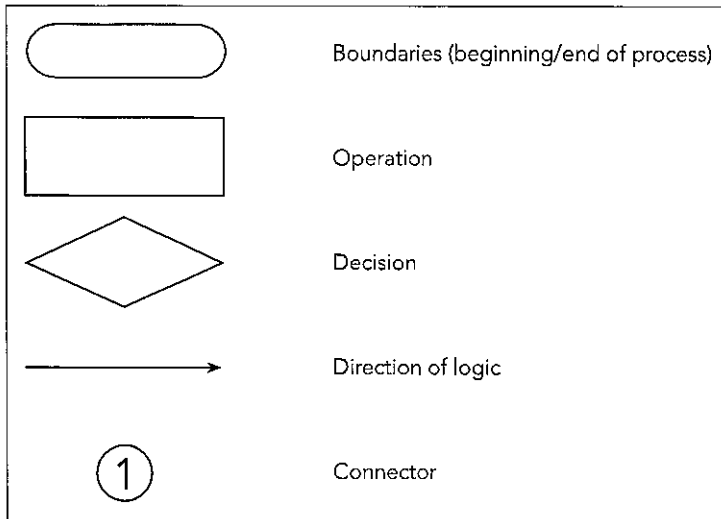
We will use the term **process model** to describe any abstract representation of a process. A process model can be as simple as a diagram with boxes and arrows or as complex as computer software that allows for process simulation. Graphical representations are usually easier to understand than written descriptions, and process-modeling tools provide a way to describe a business process so anyone viewing the model can easily understand the process. Frequently, process models are developed by a team of employees involved in the process. The interaction required to develop a process model often reveals misunderstandings and ensures that all team members are “on the same page.” A well-developed process model provides a good starting point for analyzing a process so participants can design and implement improvements. Process models can also be used to train employees who will support the business process.

Flowcharting Process Models

Flowcharts are the simplest of the process-modeling tools. A **flowchart** is any graphical representation of the movement or flow of concrete or abstract items—materials, documents, logic, and so on. Flowcharts originated with mathematicians and computer programmers, who used them to trace the logical path of an algorithm. In the early days of computer programming, computer resources were limited, and executing a program used considerable resources. As a result, most programmers spent a significant amount of time clearly defining the logic of their programs using flowcharts before actually writing the code and testing the program.

A flowchart is a clear, graphical representation of a process from beginning to end, regardless of whether that process is an algorithm or a manufacturing procedure. Flowcharting has been used in business applications since the 1960s to help businesspeople visualize workflows and functional responsibility within organizations. Today the term **process mapping** is often used interchangeably with flowcharting, the distinction being that process mapping refers specifically to the activities occurring within an *existing* business process. Process mapping develops an “as is” representation of a process, with a goal of exposing weaknesses that need to be addressed. Once a company develops a process map, it can perform a **gap analysis**, which is an assessment of disparities between how the process currently works and how the organization wants it to work.

Flowcharting uses a standardized set of symbols to represent various business activities. You can use a wide range of symbols for process mapping, but the basic set shown in Figure 7-1 is sufficient to describe even a complicated business process. Using a few simple symbols places the focus on the process rather than on the tool used to represent it.



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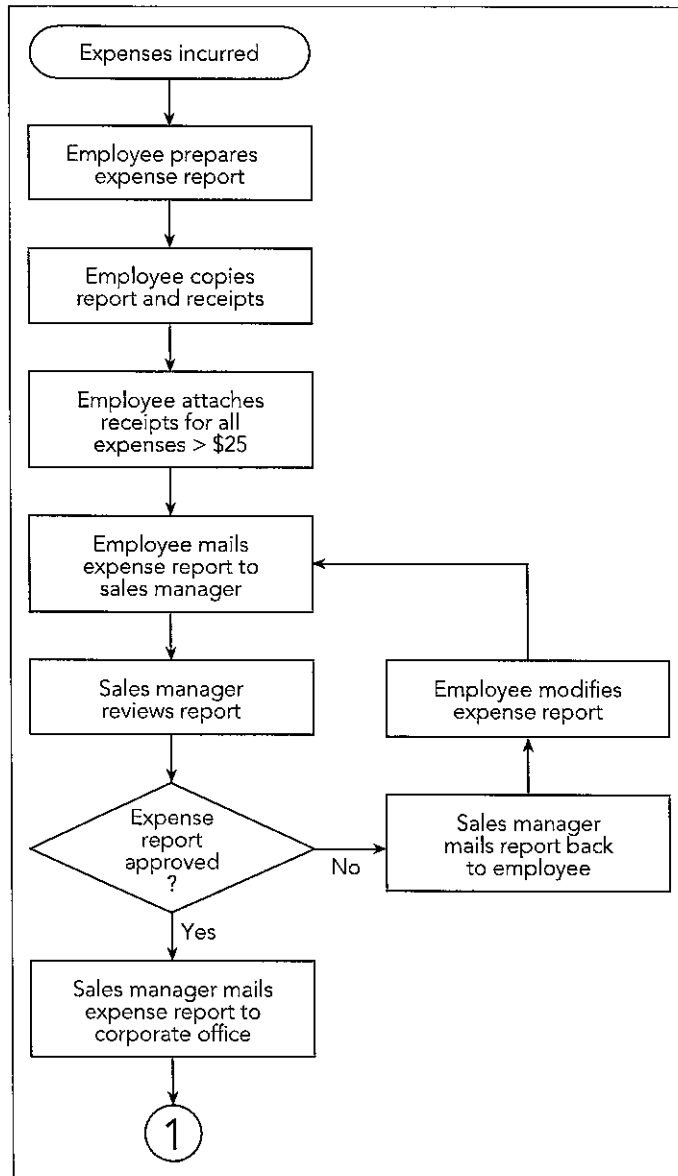
FIGURE 7-1 Basic flowcharting symbols

The next section describes Fitter Snacker's process for reimbursing sales personnel for their business expenses; we will use this example to illustrate process mapping.

Fitter Expense-Reporting Process

Maria is a Fitter salesperson who travels frequently for her job. After Maria incurs travel expenses on her personal credit card, she completes a paper expense report, makes a copy for her records, attaches receipts for any expenses over \$25, and mails the report to her zone manager at the branch office. The manager, Kevin, reviews the report and either approves it or mails it back to Maria with a note asking for an explanation, verification, or modification. Once Kevin approves the expense report, he mails it to the corporate office. After the administrative assistant sorts the mail at the corporate office, she forwards the expense report to the accounts payable (A/P) clerk, who performs a preliminary check of the report. The clerk contacts Kevin for any necessary clarification, then forwards the expense report to the expense report auditor, who reviews it. If there is a problem with the report, the auditor mails it back to Maria, who revises it and returns it. Then the auditor enters the report into Fitter's PC-based accounting system and files a hard copy with the receipts in a filing cabinet, organized by employee name.

At the end of each week, an A/P clerk uses the PC-based accounting system to print payroll checks, payments to suppliers, and expense reimbursement checks. When Maria receives her reimbursement check, she deposits it into her checking account and mails a payment to the credit card company, which credits her card account. Figure 7-2 shows the process map for the first part of the current Fitter Snacker expense-reporting process.



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FIGURE 7-2 Partial process map for Fitter's expense-reporting process

Establishing process boundaries is one of the most important steps in process mapping. The **process boundaries** define which activities are to be included in the process, and which are considered part of the environment—external to the process. It is important to clearly define the activities that are part of the process and those that are external to the process. Without clearly defined boundaries, a project can expand to the point where it can become unmanageable. Many activities related to sales employee expenses are considered outside of the boundary of Fitter's expense-reporting process map. For example, Fitter might provide cash advances or issue corporate credit cards for travel expenses. Employees might need to make reservations for air travel or hotels

through a corporate travel office. The company might require employees to use a preferred hotel, or it might have specific policies regarding car rentals, including preferred rental companies, approved car classes, insurance, and prepaid gas. While all of these considerations are important and should be documented somewhere, the process mapped in Figure 7-2 is the *expense-reporting process*; the process boundaries do not include these additional travel-related activities. Including these external considerations in the process map would greatly increase the size of the process-mapping project and put the process-improvement project at risk. The complete process map for the expense-reporting process begins after travel expenses have been incurred and ends with the receipt by the salesperson of a refund check. These starting and end points are the process boundaries for the expense-reporting process.

All processes should have only one beginning point and one ending point. In Figure 7-2, the beginning process boundary is represented by the oval figure containing the text “Expenses incurred.” Next, the process map shows four operation blocks that define the tasks performed by the employee in completing the expense report. The number of operation blocks used and the level of detail in the descriptions are a matter of preference and depend on the purpose for which a process map is created. If the process map will be used to improve a business process, and the members of the process-improvement team are familiar with the process, then less detail is needed. In fact, too much detail could obscure the key features of the process. On the other hand, if the process map will be used to document the process for training new sales employees, more detail is required to ensure that new employees can use the process map to follow the process properly.

Figure 7-2 also contains one decision diamond. A decision diamond asks a question that can be answered with Yes or No. In this case, the decision diamond asks whether the sales manager approves the expense report. There are only two possible options—Yes and No. It may be tempting for the novice to create process maps with decision diamonds that have more than two outcomes; however, doing so can lead to confused logic. All business processes can be defined using one or more decision diamonds, each with only two outcomes.

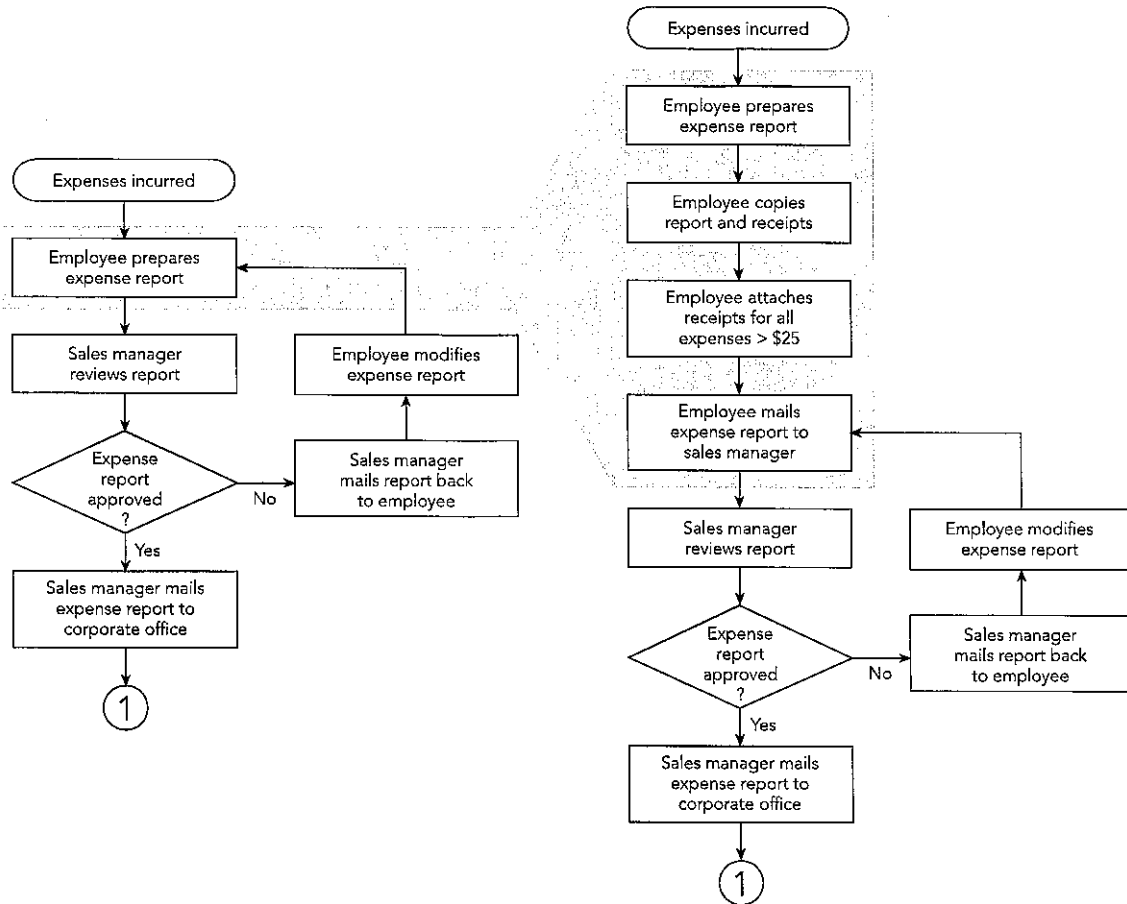
Finally, because Figure 7-2 only shows part of the expense-reporting process, the flowchart ends with a connector. Most business processes are too complicated to fit on a single sheet of paper. Connectors provide a way to continue process maps from one sheet to the next.

Exercise 7.1

Complete the process map for the Fitter Snacker expense-reporting process started in Figure 7-2, using the description of the process provided at the beginning of this section and the process-mapping symbols shown in Figure 7-1.

Extensions of Process Mapping

The development of computer technology—specifically, high-quality graphical interfaces—has allowed process-mapping tools to evolve beyond the simple symbols of flowcharting. One helpful tool is **hierarchical modeling**, which is a type of process mapping in which a business process can be described in greater or less detail, depending on the task at hand. Figure 7-3 illustrates a hierarchical model of Fitter’s expense-reporting process.

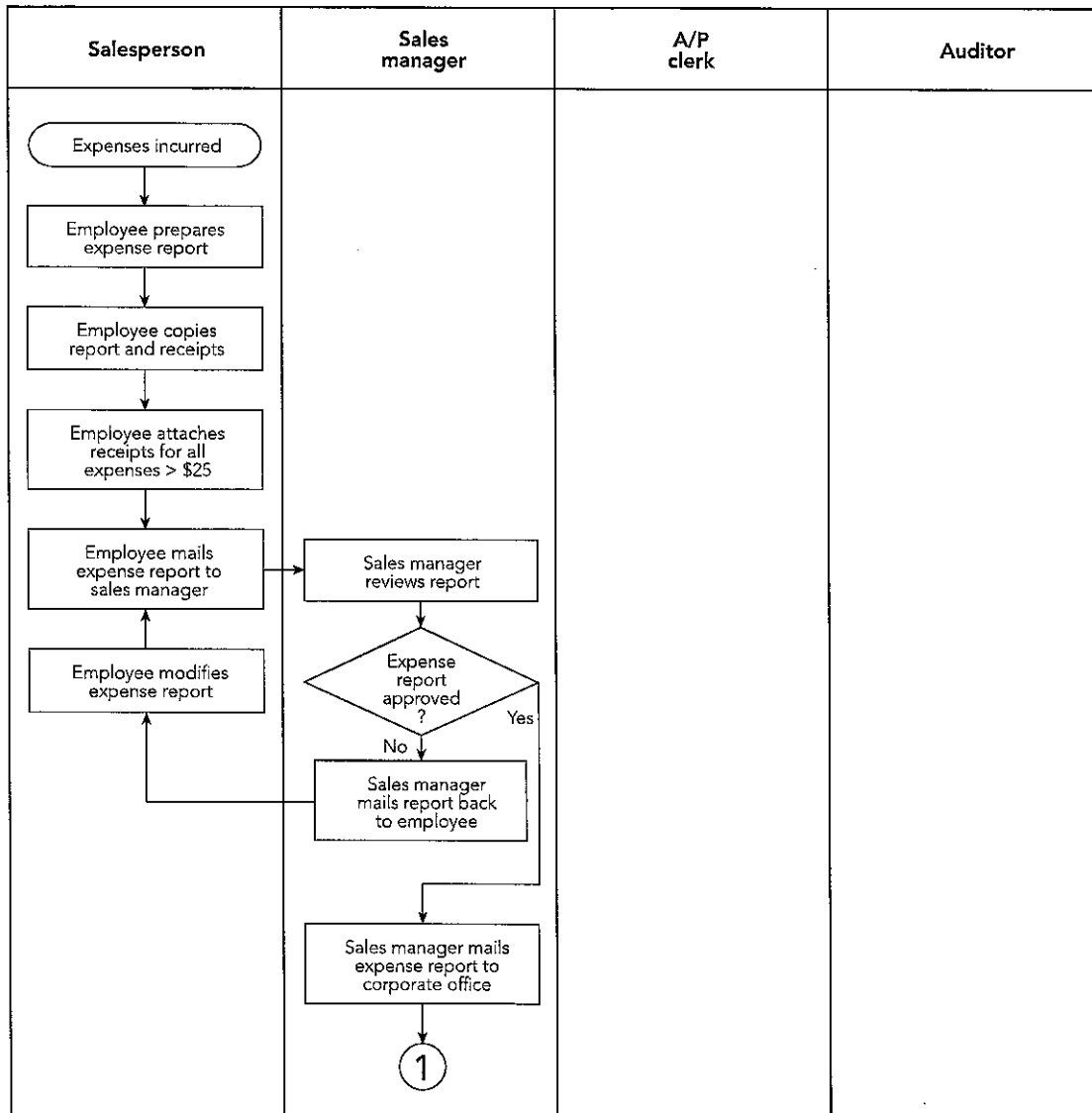


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FIGURE 7-3 Hierarchical modeling of Fitter's expense-reporting process

For training purposes, it is important to document the detailed steps a salesperson must follow to complete an expense report; however, the details can make the process map cumbersome for process-improvement activities. In hierarchical modeling, the four steps that the salesperson follows to complete an expense report can be condensed into one step: "Employee completes expense report." Hierarchical modeling software provides the user with the flexibility to move easily from higher-level, less detailed views to lower-level views with more details. Hierarchical modeling can aid in process mapping by allowing a user to create a broad, high-level view of a process and then add more detail as the process is analyzed.

Another widely used and widely recognized type of process-mapping technique is **deployment flowcharting** (also known as **swimlane flowcharting**). This type of flowchart depicts team members across the top, with each step aligned vertically under the appropriate employee or team. Figure 7-4 shows the Fitter expense-reporting process as a deployment flowchart. This process-mapping technique has the advantage of clearly identifying each person's tasks in the process.



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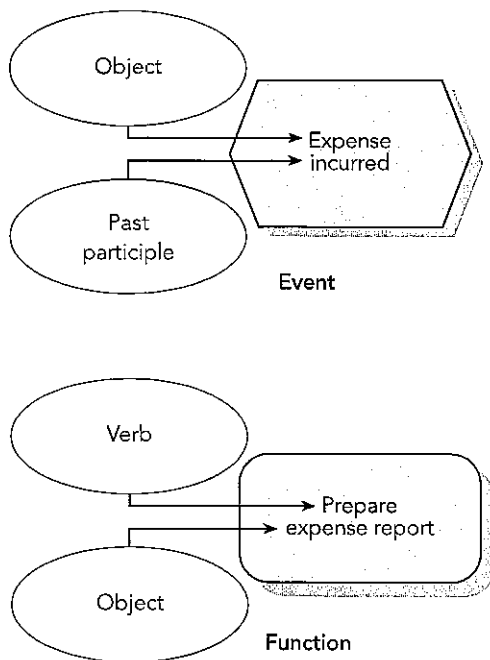
FIGURE 7-4 Deployment, or swimlane, flowcharting of Fitter's expense-reporting process

Event Process Chain (EPC) Diagrams

SAP's ERP software supports hundreds of business processes, and SAP has developed graphical models for many of these business processes using the **event process chain (EPC)** format. The EPC format uses only two symbols to represent a business process. The advantage of the EPC format is that it matches the logic and structure of SAP's ERP software design. The EPC modeling technique is available as a software tool through Software AG's ARIS (Architecture of Integrated Information System) platform.

In EPC modeling, the two structures used to represent business processes are *events* and *functions*. Figure 7-5 shows the graphical representations of events and functions in

EPC modeling. Events reflect a state or status in the process and are represented by an elongated hexagon, and functions reflect the part of the process where change occurs and are represented by rectangles with rounded corners.



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FIGURE 7-5 Event process chain (EPC) components

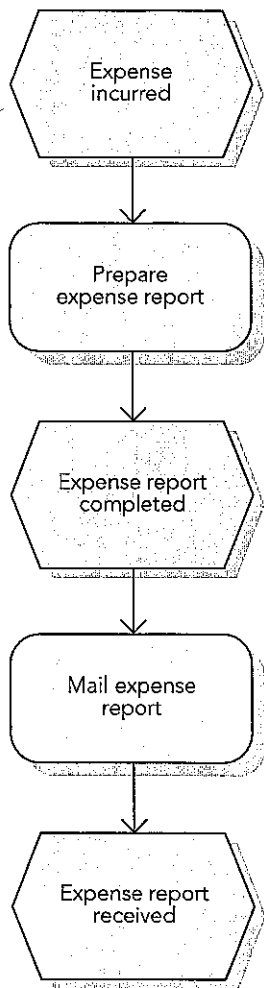
A standardized naming convention for functions and events is also used in EPC modeling. For example, the convention for naming events is object—past participle, as shown in the following examples:

Object	Past Participle
Expense	incurred
Expense report	approved
Hard copy	filed

For functions, the naming convention is verb—object, as shown in the following examples:

Verb	Object
Prepare	expense report
Review	expense report
Mail	refund check

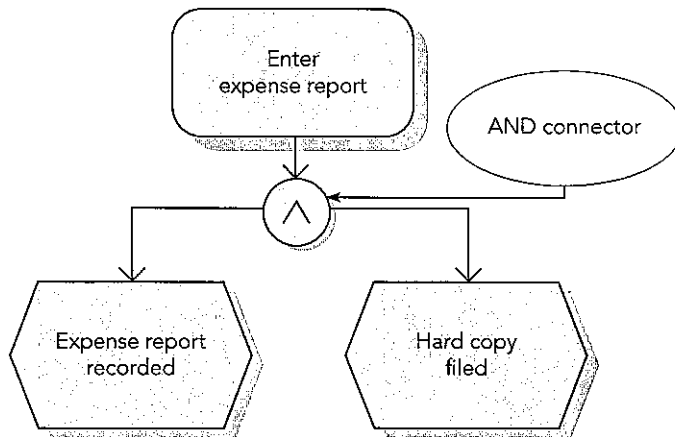
Figure 7-6 shows a simple EPC diagram for part of the Fitter expense-reporting process. EPC diagrams begin and end with events. Furthermore, events must be followed by functions, and functions must be followed by events.



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FIGURE 7-6 Basic EPC layout

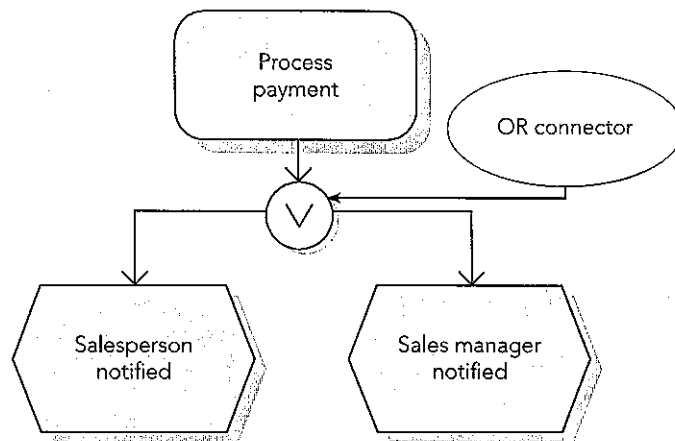
In addition to direct connection of events to functions, EPC diagrams employ three types of branching connectors. Branching occurs when logic either comes from more than one source or proceeds to more than one potential outcome. The three connector types are AND, OR, and Exclusive OR (XOR). Figure 7-7 shows how the AND connector functions. The figure indicates that the expense report must be recorded and a hard copy must be filed.



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FIGURE 7-7 AND connector in an EPC diagram

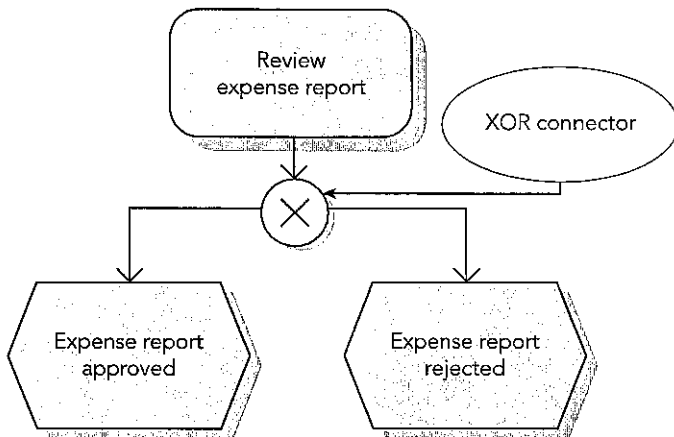
The OR connector indicates that one or more potential outcomes could occur; it is not exclusive. Figure 7-8 shows an application of the OR connector, which indicates that after a payment is processed, the salesperson is notified, or the sales manager is notified, or both the salesperson and sales manager are notified.



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FIGURE 7-8 OR connector in an EPC diagram

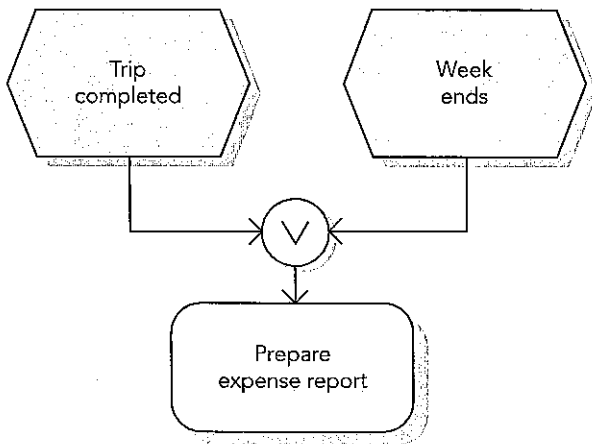
Figure 7-9 shows how the XOR connector can be used to represent the manager's decision on whether to approve the expense report. Unlike the OR connector, the XOR connector is exclusive; only one event can occur after an XOR connector. Figure 7-9 indicates that only one event can occur after reviewing the expense report: it is approved or it is not approved.



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FIGURE 7-9 XOR connector in an EPC diagram

Figures 7-7 through 7-9 show one function connecting to two events using a branch connector; however, it is not always the case that functions lead into the connector, nor do multiple events always follow the connector. For example, Fitter could require that salespeople complete expense reports at the end of a short sales trip, but at the end of each week if a trip lasts more than one week. This condition is illustrated in Figure 7-10, where the preparation of the expense report can be triggered by either of two events: the end of the trip *or* the end of the week. It is also possible that more than two events could trigger the function.

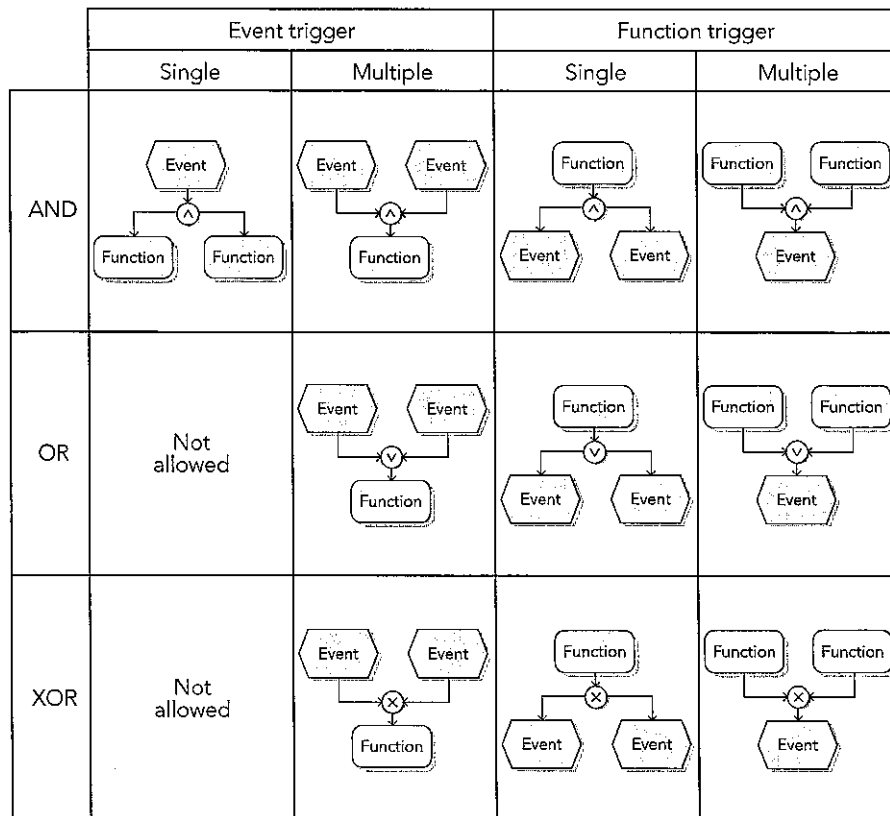


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FIGURE 7-10 OR connector with two triggering events

Figure 7-11 shows all possible connection combinations. Note that it is not possible to have a single event connect to multiple functions with OR or XOR connectors, because events represent a status or state. When OR and XOR connectors lead to multiple

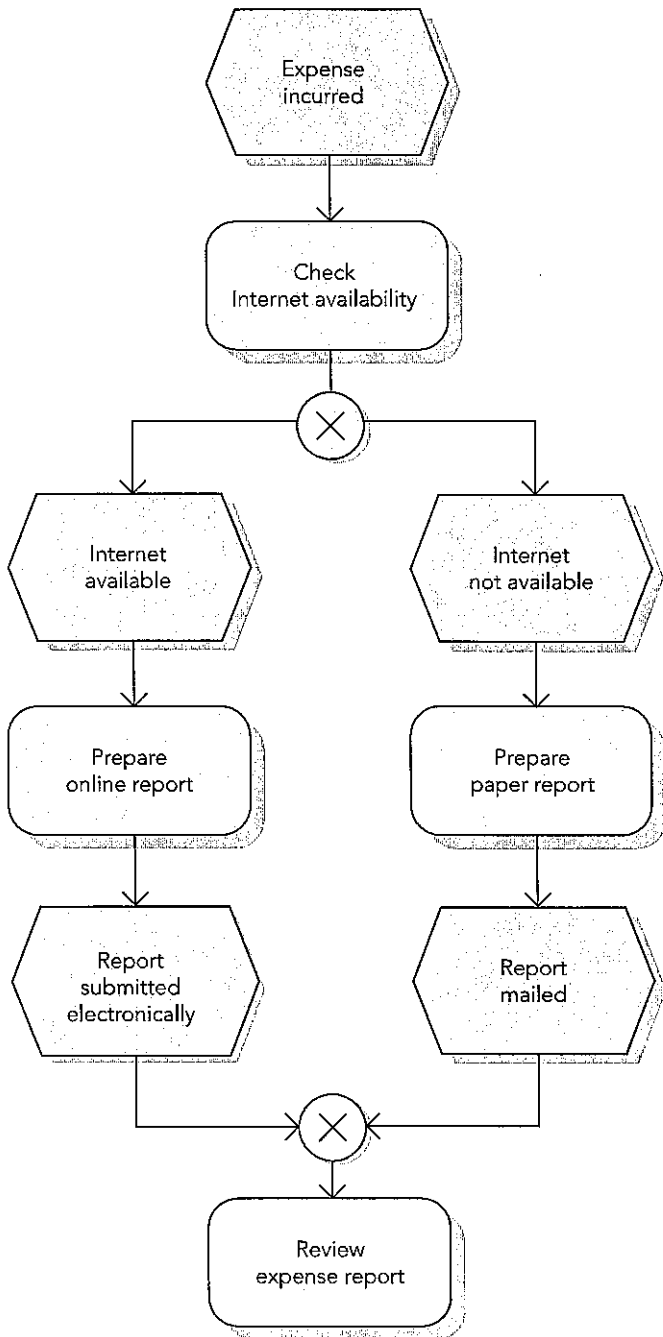
outcomes (functions or events), then a decision is required to decide what path(s) should be followed and an event cannot produce a decision.



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FIGURE 7-11 Possible connector and triggering combinations

Finally, Figure 7-12 shows the splitting and consolidating of a path through the process. In this case, the Fitter salesperson can submit her expense report online if she has Internet access; otherwise, she must send in a paper report. Note the same type of connector that is used to split the path must be used to consolidate it.

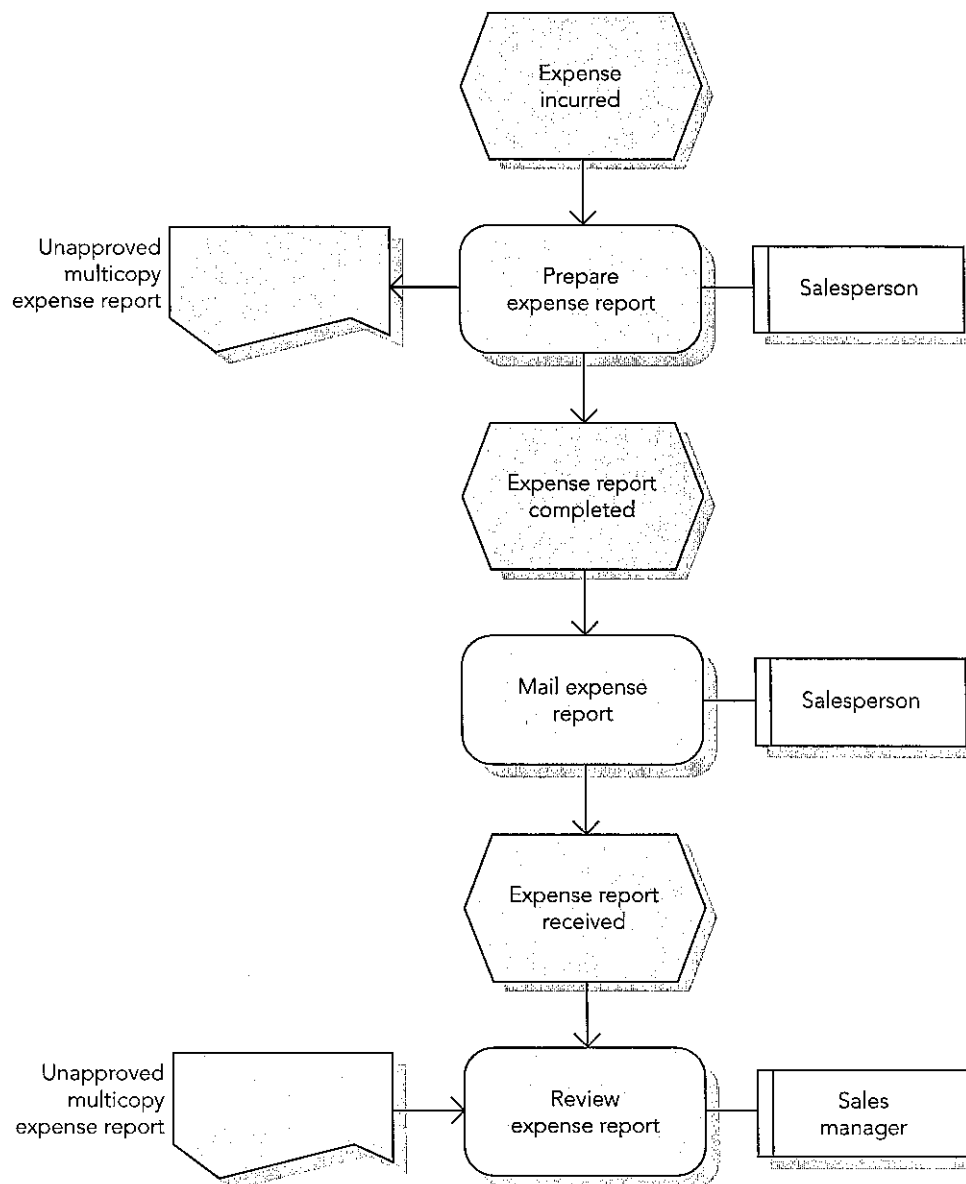


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FIGURE 7-12 Splitting and consolidating paths

The basic EPC diagram can be augmented with additional information. In EPC terminology, this additional information is called a data element. For example, Figure 7-13 shows the first part of an EPC diagram for the Fitter expense-reporting process; the diagram also shows data elements (“Unapproved multicopy expense report”) and organizational elements (“Salesperson,” “Sales manager”). The additional elements allow

for a more complete description of the process, documenting the “who” and “what” aspects of the process.



Source Line: Course Technology/Cengage Learning.

FIGURE 7-13 EPC diagram with organizational and data elements

Exercise 7.2

Using the description of the process provided earlier in the chapter, complete the EPC diagram of the Fitter expense-reporting process shown in Figure 7-13. Add both the logic elements (events, functions, and connectors) and the organizational elements.

PROCESS IMPROVEMENT

Process-mapping tools provide the ability to describe business processes in a universally understood format. Generally, the task of mapping a process requires a team consisting of key personnel who are involved in the process. Frequently, the act of accurately describing the process, and understanding how the functional areas interact, make it obvious to the team what steps are necessary to improve the process. This is especially true for organizations that have previously focused on functional responsibilities rather than business processes.

Using the simple technique of value analysis can also generate process-improvement ideas. In **value analysis**, each activity in the process is analyzed for the value it adds to the product or service. The **value added** is an increase in a product's or service's value, from the perspective of the customer. Activities can add:

- *Real value*—Value for which the customer is willing to pay
- *Business value*—Value that helps the company run its business
- *No value*—An activity that should be eliminated

The Fitter expense-reporting process does not provide real value, because Fitter's customers do not care whether sales employees receive prompt and accurate reimbursement of their business expenses. However, the expense-reporting process does add business value, and it should provide this value at a minimum cost. Determining the value of a good or service is easy—it is what someone is willing to pay for it. Evaluating the value of part of a business activity, however, is not an exact science because parts of a process cannot be sold on the open market. Although it is a challenging task, evaluating each activity on the basis of value provided can highlight opportunities for improvement. Activities that cost more than their value added should be improved.

The value analysis concept can be expanded to an evaluation of both the time and cost of each process step. For each step in the current process, you estimate the actual time and cost. Then you estimate the value-added time and cost—determining how much of the actual time is adding value and how much of the cost is worth paying for.

We will use the "Mail expense report" function of Fitter's expense-reporting process to illustrate value analysis. This function could cost upwards of \$50, including not just the cost of the envelope and postage, but also the time spent by the salesperson to mail the expense report. The value analysis includes the elapsed time for mailing the expense report, including the time it takes the salesperson to find a mailbox, the time the postal service takes to deliver the expense report to the company headquarters, and the time it takes the company's internal mail system to deliver the expense report to the sales manager.

Suppose that for Fitter the elapsed time is typically three days. To perform value analysis, you would determine how much of this time and cost is value added. To determine this value, you must view the activity "Mail expense report" in terms of what is actually being accomplished. In this case, it is not the physical transmission of paper that matters. Mailing the expense report is a means to transmit expense data and documentation. Email could minimize the time and cost required to transmit that data; therefore, mailing an expense report at a cost of \$50, to arrive in three days, is only providing value worth pennies (which is the cost to send an email) in a function that could be executed within seconds. Looking at the current time and cost of each process

step, then asking, “What is actually being accomplished, and what is the value?” can help identify areas for process improvement.

Each step in a business process should be challenged to determine if it is providing value. H. James Harrington, in his book *Business Process Improvement*, suggests that companies ask the following questions about their business processes to identify areas for improvement:

- Are there unnecessary checks and balances?
- Does the activity inspect or approve someone else’s work?
- Does it require more than one signature?
- Are multiple copies required?
- Are copies stored for no apparent reason?
- Are copies sent to people who do not need the information?
- Is there unnecessary written correspondence?
- Are there people or agencies involved that impede the effectiveness and efficiency of the process?
- Do existing organizational procedures regularly impede the efficient, effective, and timely performance of duties?
- Is someone approving something they already approved (for example, approving capital expenditures that were approved as part of a budget)?
- Is the same information being collected at more than one time or location?
- Are duplicate databases being maintained?

Harrington also suggests using the following approaches to improving processes:

- Perform activities in parallel (for example, approvals).
- Change the sequence of activities.
- Reduce interruptions.
- Avoid duplication or fragmentation of tasks.
- Avoid complex flows and bottlenecks.
- Combine similar activities.
- Reduce the amount of handling.
- Eliminate unused data.
- Eliminate copies.

Evaluating Process Improvement Prior to Implementation

While identifying process improvements can be difficult, implementing them is even more challenging. Disrupting the current process to make changes can be costly and time consuming, and managers are frequently reluctant to risk trying process-improvement ideas—especially if the ideas require a significant change in the way an activity is completed. One way to mitigate this risk is to use dynamic process modeling to evaluate process changes before they are implemented. **Dynamic process modeling** takes a basic process flowchart and puts it into motion, using computer simulation techniques to facilitate the evaluation of proposed process changes. Computer simulation repeatedly generates random variables (such as customer orders) that interact with a logical model of the business process to predict the performance of the actual system. A dynamic process model can estimate the performance of a system, using measures such as cycle time (how long the process takes), productivity, total cost, idle time, and bottlenecks.

ANOTHER LOOK

Business Process Management—A Business Responsibility

Although many people may think of automating a process as an IT responsibility, it is not. It is a business responsibility. Business users within an organization must agree on what the old business processes are before the organization can begin to think about adopting—and automating—new business processes. That is exactly what happened with the Royal Pharmaceutical Society of Great Britain (RPSGB).

The RPSGB is the professional body for pharmacist professionals in Great Britain. The RPSGB's responsibilities include investigating complaints against pharmacists and pharmacy technicians, and recommending criminal prosecutions, when appropriate.

The RPSGB's business process management project began in response to challenges the organization was experiencing with the Access database system that handled complaints. By 2006, the database could no longer effectively handle the volume of complaints the RPSGB was receiving, so the organization established a team to introduce new software to help manage its complaint process. Initially, the team could not decide which processes the new software should automate. Team members also disagreed on what level of automation was required and on what type of documentation needed to be maintained. Therefore, the team decided they needed to define the organization's current business processes before determining how to make the complaint management process more efficient. The team created various process maps to develop a graphic representation of the existing processes.

The complaint process begins when a complaint is filed against a pharmacist. For example, complaints might be triggered by a rude pharmacist or, more seriously, by a drunk pharmacist dispensing the wrong medication. Some types of complaints require specific actions, which were documented with the process map.

Only after the team had mapped all the current processes and identified ways to make them more efficient was software applied to automate those processes. The team also worked with the British government to ensure the new processes had the flexibility to be changed quickly if new rules governing the pharmaceutical industry were passed in Parliament.

The entire project took almost two years to complete. During that time, the RPSGB focused considerable energy on change management to convince those involved that changing the processes was worthwhile. In this case, many employees were more easily convinced of the merits of the project because legislation that would require certain process changes was due to be passed shortly. The new automated system greatly reduced the RPSGB's dependence on paper, and it helped the organization achieve its goal of having 80 percent of all cases requiring further action being filed with the organization's Investigation Committee within three months of the completion of the initial investigation.

Questions:

1. Why is it important to understand your current business processes before trying to improve them?
2. Why might it be difficult for a group of workers to come to an agreement about what their current business processes are?

ERP WORKFLOW TOOLS

Most business processes are performed regularly, enabling employees responsible for the process to become efficient in the tasks involved in the process. For example, the sales order process is fundamental to a manufacturing business; the salespeople, sales order clerks, warehouse managers, accounts receivable clerks, and others spend most of their day supporting the process. If the process is efficiently designed and managed, and the employees are properly trained, workers will experience enough repetition to become efficient in their daily tasks.

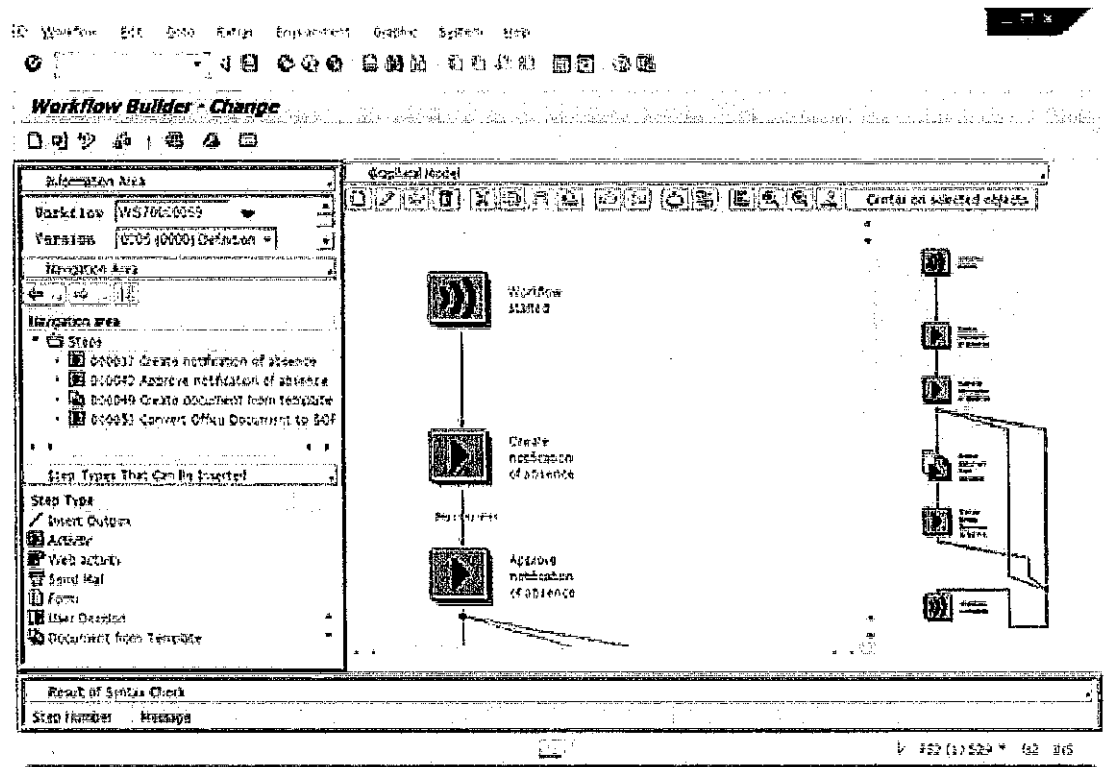
Some business processes, however, are performed only sporadically. Often, such processes are inefficient, especially when the processes involve more than one functional area. Work may “fall through the cracks,” not necessarily through negligence, but due to a lack of repetition. For example, the process of establishing credit limits may occur only occasionally and may require coordination between the Sales Department, which identifies new customers and gathers basic data (contact names, addresses, contract terms and conditions) and the Accounts Receivable Department, which evaluates a customer’s credit history to establish a credit limit. Unless employees manage the process of establishing a credit limit properly, a new customer’s order may be blocked for an unacceptable length of time. For sporadic processes such as this, a workflow software tool can help employees avoid “dropping the ball” by providing tools for tracking and monitoring the tasks in the project and providing reminders to the employees involved.

Workflow tools are software programs that automate the execution of business processes and address all aspects of a process, including the process flow (the logical steps in the business process), the people involved (the organization), and the effects (the process information that documents the process steps). ERP software provides a workflow management system that supports and speeds up business processes. It enables employees to carry out complex business processes and track the current status of a process at any time.

The SAP ERP workflow tool, called SAP Business Workflow, links employees to the business transactions that need to be performed. In a normal business process, an employee uses his or her knowledge to determine what transactions to process at what times. Sometimes this work is triggered by an external source, such as a customer call that causes the sales order clerk to perform the sales order creation transaction. In other cases, an employee uses a reporting tool to determine what transactions need to be processed. For example, as discussed in Chapter 5, industrial credit management is implemented by blocking sales orders when there is a credit issue. The blocked sales order report (shown in Figure 5-7) is the report that an employee can use to decide what transactions must be processed to resolve the credit issue.

In the case of sporadic processes, the SAP Business Workflow tool proactively connects employees with business transactions using SAP’s internal email system and **workflow tasks**, which are email messages that can include basic information, notes, and documents, as well as direct links to business transactions. The SAP system can monitor workflow tasks, and if the tasks are not completed on time, the workflow system can automatically take various actions, including changing the workflow task priority and sending email reminders to the employees responsible for the work.

Consider vacation requests. Employees performing critical operational tasks within an organization may be required to request time off from work in advance. The process of requesting time off is likely a relatively infrequent process that can create operational and employee morale problems if not handled properly. As such, it is a prime candidate for a workflow tool. In SAP, the Workflow Builder is used to define the process behind a workflow. In addition to defining the steps in a business process, the software identifies individuals involved in the process and sets other process parameters. Figure 7-14 shows a Workflow Builder screen for the workflow that manages an employee's request for time off.



Source Line: SAP AG.

FIGURE 7-14 SAP ERP Workflow Builder screen

In the first step in this process, an employee completes the Create Notification of Absence screen (shown in Figure 7-15) to request time off from work.

Form Edit Goto System Help

Create Notification of Absence

Application Data

Number: 157 Status: New

Personal Data

Name: Regina Caspers
 Department: Human Resources
 Personnel no.: 114144 COR CENTER: HR001

Absence Data

	By	To	Hours	Leave Type
Leave 1	12/14/2011	12/23/2011		Vacation
Leave 2				Vacation
Leave 3				Vacation

Reason: Family holiday vacation
 Contact at:

Entry and Approval

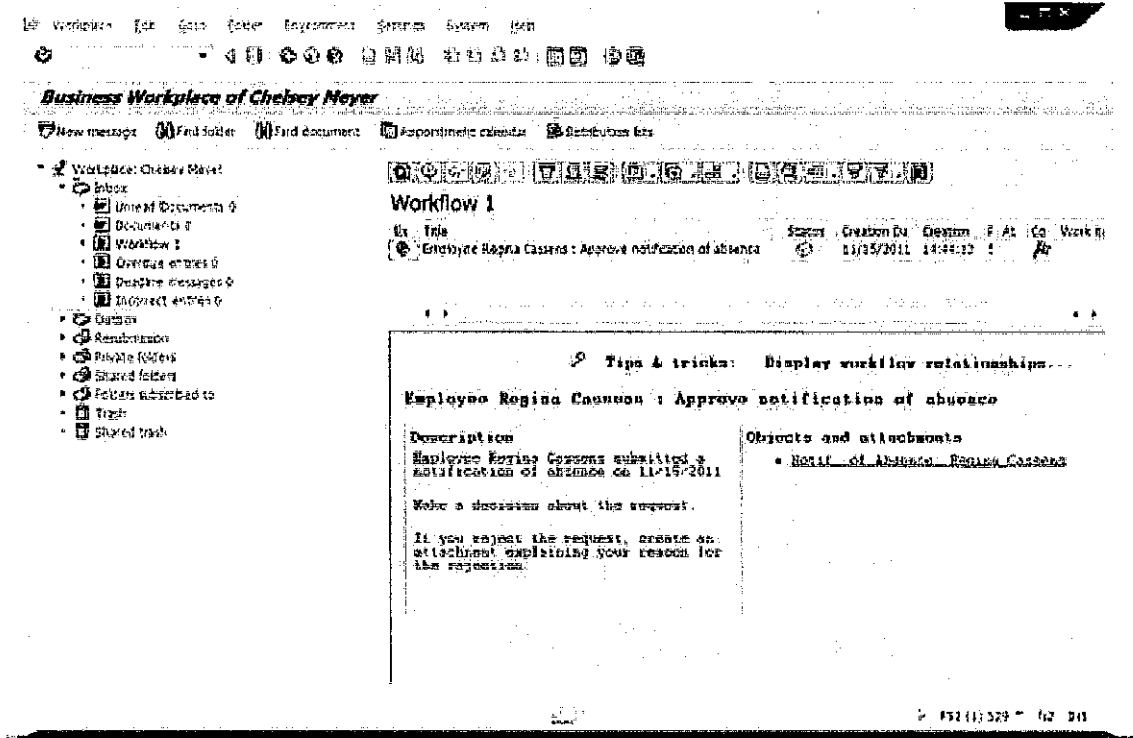
Date: 11/15/2011 Date:
 Issued: 11/15/2011 Approver:

Source Line: SAP AG.

FIGURE 7-15 Create Notification of Absence screen

Once the employee completes this screen, the time-off request becomes a workflow item in the Business Workplace for the employee's supervisor. The Business Workplace is an interface for accessing a variety of SAP functions, including email, a calendar, and workflow—similar to other comprehensive communication and collaboration software packages such as Microsoft Outlook or IBM's Lotus Notes software.

Figure 7-16 shows a request for time off in the Workflow inbox of the manager's Business Workplace. From this screen, the manager can either approve or deny the request. If the request is approved, the employee receives notification of the approval by email. If the request is denied, the manager can include a note explaining the rationale. The rejected request will be sent to the employee's Workflow inbox, where that person can either modify the request or cancel it.



Source Line: SAP AG.

FIGURE 7-16 Manager's Business Workplace with workflow task

SAP's workflow tool provides a number of useful features. Employees can track the progress of workflow tasks they have an interest in, reviewing their status at any time. The system can be programmed to send reminders to the employee(s) responsible for a task after a predetermined period of time. Managers can also build flexibility into workflow tasks in terms of who can perform the task. For example, suppose that the Accounts Receivable (A/R) Department has three employees who can set credit limits. The A/R manager could create a workflow task to set a new customer's credit limit and send it to the Workflow inbox of all three A/R employees. When one of the employees completes the task, the system removes it from all three Workflow inboxes. The manager could also generate statistics on the number of workflow tasks handled by each employee and the average time taken to complete the tasks, resulting in better staffing decisions.

For regular, day-to-day business processes, workflow tools are not required. But for sporadic processes—those that are repeated frequently enough to justify the development costs—workflow tools are a powerful way to improve process efficiency and effectiveness.

IMPLEMENTING ERP SYSTEMS

In Chapter 2, you learned about some of the issues and challenges in implementing ERP systems. Implementation was particularly challenging in the late 1990s, as many firms rushed to implement ERP systems to avoid the Y2K problem. The explosive growth in demand for ERP implementations at that time caused a significant shortage of experienced consultants. Since 2000, the pace of implementations has slowed considerably. Most Fortune 500 firms have

implemented an ERP system. The current growth area in ERP implementations is in the small to midsized business market, and vendors have been developing products, including Microsoft Dynamics and SAP Business One, tailored to this market.

Recall that the implementation of ERP is an ongoing process, not a one-time task. ERP systems are extremely complicated, and no company ever takes full advantage of all the capabilities in a system. Because of the challenges in the initial implementation of an ERP system, many firms limit the scope of the implementation projects to only what is absolutely necessary to operate the business, and rightly so. After the implementation is complete and the system is running smoothly, many firms seek to further improve their business processes by updating and expanding upon their original ERP system implementation. These follow-on implementation projects, while smaller than the initial ERP implementation, still require effective management.

ANOTHER LOOK

Business Process Improvement at Multi-Chem

What do you do when your organization grows so rapidly that documents start to fall through the cracks? Smart companies turn to business process management to help them get their organizations running more efficiently. Multi-Chem, an international specialty chemicals company selling to the oil and gas industry, did just that in an attempt to improve its business processes. The company is based in San Angelo, Texas, and has over 700 employees. Due to its rapid growth, the company's document approval processes had become slow and ineffective. Documents, such as vacation requests, were only trickling through an inefficient approval process and some were even languishing on workers' desks.

Before setting out to improve this inefficient business process, Multi-Chem's management established some criteria for the solution. The company wanted a program that was more than a simple email system; the solution had to be able to manage documents electronically, and it needed to be able to control the processes' workflow. Management also wanted to put the system in the user's hands, that is, they did not want a system that the IT Department would have to manage on a daily basis. In addition, the solution needed to be scalable since the company was growing fast.

The solution chosen by Multi-Chem was BP Logix's Process Director. Internally, Multi-Chem refers to the new system as eDocs. The company focused first on creating a new personnel request form, which is used for new hires and new positions. With the new system, Multi-Chem was able to design a user-friendly form that simplified the hiring process, and because the new form and process was so intuitive, it was widely accepted by employees. And through the system's use of audit trails, tracking authorizations has been simplified. Further implementation phases included the development of new documents and workflows for approving capital expenditures, training employees, and creating customer profiles.

Multi-Chem's eDocs system continues to save the company money and time. All employees are using eDocs, and the system has become a critical part of their work.

Question:

1. Think of an example of a paper-based inefficient business process, such as one you might see at a traditional doctor's office. How could an electronic document system that uses workflow improve the efficiency of that process?

ERP System Costs and Benefits

As you learned in Chapter 2, ERP implementation is expensive (with costs ranging between \$10 million and \$500 million, depending on company size). The costs of an ERP implementation include the following:

- *Software licensing fees*—ERP software is quite expensive, and most ERP vendors charge annual license fees based on the number of users.
- *Consulting fees*—ERP implementations require the use of consultants with the skills to configure the software to support the company's business processes. Good consultants have extensive experience in the way ERP systems function in practice, and they can help companies make decisions that avoid excessive data input, while capturing the information necessary to make managerial decisions.
- *Project team member time*—ERP projects require key people within the company to guide the implementation. These are team members who have detailed knowledge of the company's business. They work closely with the consultants to make sure the configuration of the ERP software supports the company's needs, which means these workers are frequently taken away from their daily responsibilities.
- *Employee training*—Project team members need training in the ERP software so they can work successfully with the consultants in the implementation. Those team members also frequently work with training consultants to develop and deliver company-specific training programs for all employees.
- *Productivity losses*—No matter how smoothly an ERP implementation goes, companies normally lose productivity during the first weeks and months after switching to a new ERP system.

To justify the costs associated with an ERP system, a company must identify a significant financial benefit that will be generated by the use of the software, but the only way a company can save money with an ERP system is by using it to support more efficient and effective business processes. This means that an implementation project should not just re-create the company's current processes and information systems, although that is a possibility since SAP provides the source code with its ERP package. A company could choose to alter the package through SAP's internal programming language, called Advanced Business Application Programming (ABAP)—which you first learned about in Chapter 2. With access to the SAP ERP source code, it is possible for a company to spend a significant sum of money on software code development to avoid changing a business process to the best practice process designed into the ERP software. Many companies have difficulty handling change and prefer to continue doing business as they always have—rather than adopting the best practices built into the ERP system.

As part of the implementation, a company must also manage the transfer of data from its old computer system to the new ERP system. In addition to managing master data such as materials data, customer data, vendor data, and so on, a company must also transfer transaction data, which includes sales orders and purchase orders, many of which are likely to be in various stages of processing—a challenging task.

IMPLEMENTATION AND CHANGE MANAGEMENT

How does a company ensure that its ERP investment pays off in increased profitability? The key challenge is not in managing technology, but in managing people. An ERP system changes how people work, and for the system to be effective, the change may have to be dramatic, going beyond the way employees interact with the software to the way they perform their tasks. Furthermore, business processes that are more effective require fewer people. Some employees will no longer be needed. It is no small thing to ask people to participate in a process that may not only change their day-to-day activities, but could also eliminate their current jobs.

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Managing the human behavior aspects of organizational change is called **organizational change management (OCM)**. Do not underestimate the importance of this aspect of the implementation process. One of the keys to managing OCM is to realize that most people do not mind change, they mind *being* changed. If the ERP implementation is a project that is being forced on the employees, they will resist it. If employees view it as a chance to make the company more efficient and effective by improving business processes—and if these process improvements will make the company more profitable and therefore provide more job security—there is a greater likelihood that employees will support the implementation efforts. As mentioned earlier, the best way to improve a business process is to have the people most familiar with the process leverage their experience and creativity to develop process-improvement ideas. When employees have contributed to a process change, they have a sense of ownership and will be more likely to support the change.

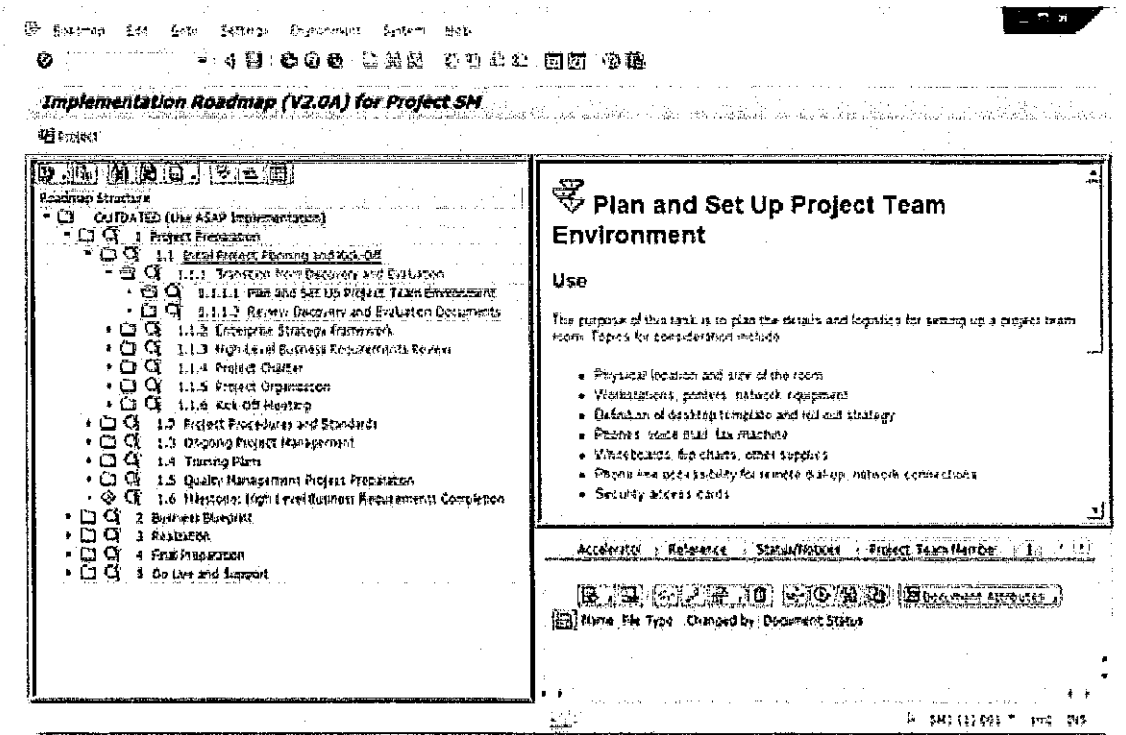
Implementation Tools

Many tools are available to help manage implementation projects. Process mapping, described previously, is perhaps the most critical. For an ERP implementation to go smoothly and provide value, it is critical that a company understand both its *current* processes and the desired state of the processes *after* implementation.

SAP provides Solution Manager, a set of tools and information that helps companies manage the implementation of SAP ERP. In Solution Manager, the ERP implementation project is presented in an Implementation Roadmap, consisting of the following five phases:

- Project Preparation (15 to 20 days)
- Business Blueprint (25 to 40 days)
- Realization (55 to 80 days)
- Final Preparation (35 to 55 days)
- Go Live and Support (20 to 24 days)

Figure 7-17 shows an example of this roadmap. The left side of the Solution Manager screen shows a hierarchical menu structure that organizes each step in the implementation, and on the right side of the screen are the detailed items, the descriptions, documents, white papers, tools, and so on to support each step.



Source Line: SAP AG.

FIGURE 7-17 Implementation Roadmap in SAP's Solution Manager

The first phase of the Implementation Roadmap is Project Preparation. Some of the tasks in the Project Preparation phase include organizing the technical team, defining the system landscape (the computer servers, networking hardware, and peripherals necessary to operate the ERP system), selecting the hardware and database vendors, and most importantly, defining the project's scope—what the project is to accomplish. A common problem in ERP implementations is **scope creep**, which is the unplanned expansion of the project's goals and objectives. Scope creep causes the project to go over time and over budget and increases the risk of an unsuccessful implementation. Defining the project's scope ahead of time helps prevent this problem.

In the second phase, Business Blueprint, project team members produce detailed documentation of the business process requirements of the company. The Business Blueprint phase results in a detailed description of how the company intends to run its business with the SAP ERP system. Process mapping is critical in the Business Blueprint phase. The results of the Business Blueprint phase will guide consultants and project team members in configuring the SAP ERP system (which occurs in the third phase). During the Business Blueprint phase, technical team members determine the method of data transfer from the firm's existing computer systems (called legacy systems), which may be replaced by the ERP system or may continue to function with the ERP system through an interface.

In the Realization phase (the third phase), the project team members work with consultants to configure the ERP software in the development system. In an SAP implementation, a company uses three separate SAP systems over the course of the implementation process—a development system for configuring the SAP software to match the Business Blueprint, a test (or *quality assurance*) system for evaluating the software configuration, and a production system, on which the company runs the final software. The team also develops any necessary ABAP code or other tools (such as third-party software packages) and creates the required connections to the legacy systems.

The fourth phase, Final Preparation, is critical to the success of the implementation project. Tasks in this phase include:

- Testing the system throughput for critical business processes (determining whether it can handle the volume of transactions) in the quality assurance system
- Setting up the help desk where end users can get support
- Setting up operation of the production system and transferring data from legacy systems
- Conducting end-user training
- Setting the Go Live date

When scope creep occurs in a project, it is commonly not discovered until well into the Realization phase, when the team begins to miss deadlines, and the costs begin to exceed the budget. By the time the scope creep is discovered and its impact is understood, there is often little management can do to correct the problem, as most of the time and budget have been spent. In some cases, management chooses to shorten or omit the Final Preparation phase, which means that testing of the system and training of employees are reduced or eliminated. Unfortunately, with reduced testing, errors in configuring the system may not be discovered until it is put into use. Likewise, with reduced training, employees may not know how to use the system properly, which can create a complicated chain of problems, due to the integrated nature of the system. Any cost savings gained by shortening the Final Preparation phase are often overshadowed by productivity losses and consulting fees in the Go Live and Support phase.

In the fifth and final phase, Go Live and Support, the company begins using the new ERP system. Wise managers try to schedule the Go Live date for a period when the company is least busy. A properly staffed help desk is critical for the success of the Go Live phase because users have the most questions during the first few weeks of working with a new system. The SAP ERP project team members and consultants should be scheduled to work the help desk during the first few weeks of the Go Live period.

Although significant testing of the system and settings should have been done throughout the project, it is not possible to test all the settings and thoroughly evaluate the throughput of the system. Therefore, monitoring of the system during the Go Live and Support phase is critical so changes can be made quickly if the performance of the system is not satisfactory. Finally, it is important to set a completion date for the project. Any enhancements or extensions to the system should be managed as separate projects, not as extensions of the original implementation project.

ANOTHER LOOK

ERP Implementations Help Nonprofits

Direct Relief International, a nonprofit organization providing medical supplies and assistance to people affected by poverty, disaster, and civil unrest around the world, has used its recent implementation of an online community network to help those in need. While many nonprofits are well intentioned, they often lack the information they need to be effective. For instance, in the aftermath of the Haitian earthquake disaster in January 2010, many containers of medical supplies sat at airports, unable to reach their destination. With its online network, which is built on a foundation of SAP software, Direct Relief was able to supply victims of the earthquake with over \$50 million in support—due to the organization's close attention to supply chain and logistics details.

Direct Relief initially implemented some SAP ERP modules in 2008, with a second phase in 2010. In the second stage, a new online community network interface was built using SAP's NetWeaver Portal. In addition, SAP's CRM, BusinessObjects, and Business Warehouse tools were used to create the online network, which brings donations together with need. Direct Relief's goal was to bring the efficiency of a profit-oriented company to its nonprofit organization. After users are registered and screened, they can log on to a secure portal to donate medicine and volunteer medical services. Those requesting aid can do the same to determine what supplies and services are available. The network was initially rolled out to users in the United States only; however, the new system was so successful that it has since been expanded to 70 countries.

According to Direct Relief's President and CEO, Thomas Tighe, the nonprofit has been "able to increase the flow of aid provided, help more people at a lower cost, and produce more precise reporting," all of which helps the organization match the needs of a particular group to that of a supplier of that required product or service. The new system also proved it is scalable. During the Haiti earthquake crisis, donations made through the network doubled in a two-week period, and over the course of a few days, the number of system users (donating and supplying) grew by 300 percent.

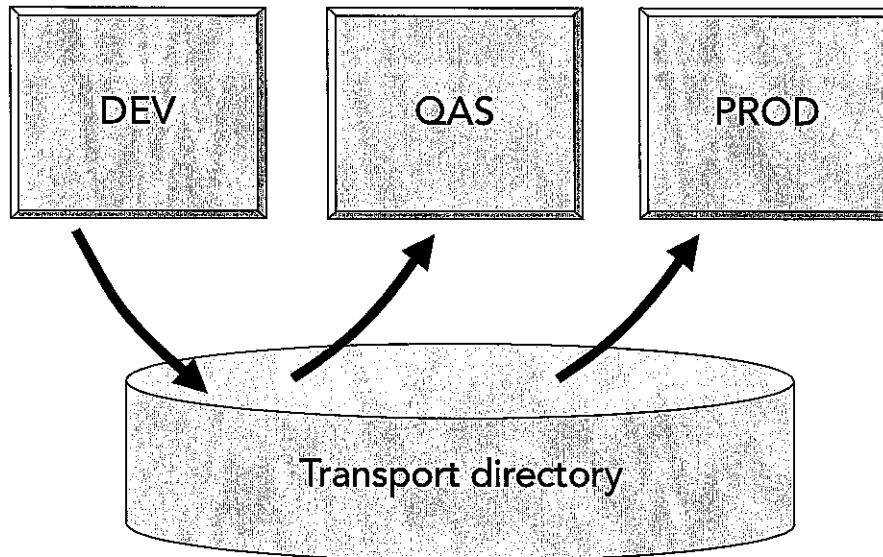
Ross Comstock, the IT director, also explains how the new system is highly user-friendly, "Because our product donors are offering products that are in many cases already in our warehouse, we decided to adapt the e-commerce functionality to have it face upstream as well—so we can take product donations through it, which I think is pretty innovative." The efficiency of running a real-time system with a single database and integrated processes has paid off in helping those in need.

Questions:

1. Do you think implementation of an ERP system into a nonprofit organization is different than in a traditional for-profit company? Why?
2. List at least three ways an ERP system can help nonprofit organizations, and support your answers using news articles that illustrate the problems that ERP would solve.

System Landscape Concept

For an ERP implementation, SAP recommends a system landscape like the one shown in Figure 7-18. In this system landscape, there are three completely separate SAP systems, designated as Development (DEV), Quality Assurance (QAS), and Production (PROD).



Source Line: Course Technology/Cengage Learning.

FIGURE 7-18 System landscape for SAP ERP implementation

The **Development (DEV)** system is used to develop configuration settings for the system, as well as special enhancements using ABAP code. These changes are automatically recorded in the **transport directory**, which is a special data file location on the DEV server. Changes recorded in the DEV system are imported into the **Quality Assurance (QAS)** system, where they are tested to make sure they function properly. If any corrections are needed, they are made in the DEV system and then transported again to the QAS system for testing. Once the configuration settings and ABAP programs pass testing in the QAS system, all settings, programs, and changes are transported to the **Production (PROD)** system, which is the system the company will use to run its business processes.

The use of separate systems is important during the initial implementation of an SAP ERP system, and it is even more important after the Go Live phase. All software packages have occasional updates, and having systems available to test these updates before applying them to a Production system can prevent problems. If a company wants to use features of the SAP ERP system that were not included in the initial project implementation, then the company should have a process like the one SAP provides to manage future changes to the production system in a controlled fashion.

Chapter Summary

- ERP systems provide the analysis and communication tools required to support efficient and effective business processes. Process modeling is a fundamental tool for understanding and analyzing business processes.
- Process mapping is a process-modeling tool that uses graphical representations to document business processes. Other process-modeling methodologies include hierarchical modeling, deployment flowcharting, and event process chain (EPC) diagramming. Value analysis is a technique that can be used to generate process-improvement ideas, and dynamic process modeling uses software to evaluate process improvements prior to implementation.
- ERP Workflow tools provide the ability to monitor and facilitate sporadic business processes so important work does not “fall through the cracks.”
- Most challenges to ERP implementation involve managing personnel and their reactions to the change, rather than managing technical issues. Managing the human behavior aspects of organizational change is called organizational change management (OCM).
- SAP’s Solution Manager is a set of tools and information that helps companies manage the implementation of SAP ERP software. In Solution Manager, the ERP implementation project is presented in an Implementation Roadmap, consisting of five phases.
- SAP’s system landscape was introduced to show how changes to the ERP system during implementation (and beyond) are managed. In this system landscape, there are three completely separate SAP systems, designated as Development (DEV), Quality Assurance (QAS), and Production (PROD).

Key Terms

deployment flowcharting (swimlane flowcharting)	process mapping
Development (DEV) system	process model
dynamic process modeling	Production (PROD) system
event process chain (EPC)	Quality Assurance (QAS) system
flowchart	scope creep
gap analysis	transport directory
hierarchical modeling	value added
organizational change management (OCM)	value analysis
process boundary	workflow tools
	workflow task

Exercises

1. Develop a process map for the following outdated course registration process in place at a local university:
 - Students first fill out forms listing their desired classes. They bring those completed forms to the academic advisement office, where, working with an advisor, they create a course selection document. Then, the student fills out a computer-readable form with

the course and section number for all classes approved by the advisor. This form is submitted to the registration office where it is fed into a document reader, which electronically reads the completed forms; the data is then written to the master course schedule disk.

- At the end of the two-week registration period, data from the master course schedule disk is fed into the master scheduling program, which assigns students to courses. The scheduling program is designed to maximize the number of students who receive their requested courses while staying within class capacity limits. Once the master scheduling program has been updated for all students, the program produces three documents: (1) individual schedules for each student, (2) initial student lists for each class, and (3) the summary schedule report for the administration.
- After students receive their schedules, they are allowed to drop or add classes for a period of two weeks. To add or drop a class, a student must first obtain permission from the professor teaching the class. Once that signature is obtained on the drop/add form, the student brings the form to the computer center where the clerk enters the change into the scheduling system, which in turn updates the master course disk. The clerk then prints out a new schedule for that student.

2. Develop a swimlane process map for the online ordering process for Active Bicycle Company, shown below. Each of the following functions should be one swimlane: sales, accounting, warehouse, and shipping.

- The process begins when a customer submits an online order form to Active Bicycle via the Web. The customer supplies his or her name, address, email address, model number of the bicycle they desire, and credit card number.
- When the customer clicks on the Confirm button on the Web page, Active Bicycle's system gets approval for the transaction from the credit card company. If the credit charge is approved, the system assigns a number to the sales order, displays an order summary for the customer to print, and sends a confirmation email to the customer. If the credit charge is denied, the customer is asked to provide a different form of payment.
- The system then generates a two-part invoice, a stock release form, and a two-part packing slip form. The stock release form is sent to the Warehouse Department, and the two-part packing slip and one copy of the invoice are sent to the Shipping Department. The other copy of the invoice is maintained in a holding file in the Accounting Department to be filed later with the shipping certificate.
- In the warehouse, employees use the stock release form to pull the appropriate inventory to fill the order. Assuming there is enough stock (for the purposes of this exercise you can assume there is enough stock), the bicycle is packed into a special box for shipping, with added protection so it will not be damaged in transit. Using the stock release form, the warehouse staff inputs data into the inventory management program to update the master inventory file. The warehouse clerk also must take the information from the stock release form and manually fill out a shipping certificate, which is sent to the Accounting Department for a further check that the items are being released from the warehouse. The boxed inventory, along with the packing slip, is then sent to the Shipping Department.
- In the Shipping Department, one copy of the two-part packing slip is placed in the shipping department's file cabinet, and one is included with the goods to be sent to the customer.

- Back in the Accounting Department, the shipping certificate is matched with the copy of the invoice, and the accounting database is updated to record the completion of the order. The accounting program then submits a payment request to the credit card company, and both the shipping certificate and the invoice are filed in the accounting office.
3. Develop a process map for the following request-for-quote process:
- Your company assembles affordable washing machines from purchased parts. Your customers buy in bulk from you and then relabel the washing machines with their own brand. Customers typically want unique features for their washers, and they often submit a request for new features or other design changes, which results in a new model being created. Customers initiate the new design process by submitting a request for quotation (RFQ), which is a document that provides all the details for the new washing machine model, including the quantity to be ordered. Your company responds to the RFQ with a written quote, which details the cost for an order that would meet the requirements of the RFQ. Many different departments, as well as the manufacturers of the washing machine component parts, are involved in creating the quote. The Sales Department must work closely with the Costing Department, the Procurement Department, and the Assembly Department to provide a competitive quote to the customer. Create a swimlane flowchart to document the flow of information between departments and external partners in creating the quote, using the following information:
 - The following internal departments are involved in the RFQ process:
 - Sales—Receives the customer's request for a price quote; creates the final quote and sends it to the customer.
 - Assembly—Prepares production documents that detail the labor, tools, and equipment required to produce the new washing machine.
 - Procurement—Creates RFQs for vendors for any new components needed for the new design.
 - Costing (Accounting)—Computes the final cost estimate.
 - The following external parties are involved in the RFQ process:
 - Customer—Submits a request for a price quote; receives the completed RFQ.
 - Vendor—Receives the request for a quote on the cost of component parts, computes their costs, and submits a bid.
4. Develop an event process chain (EPC) diagram for the following staff-recruiting process at Yellow Brook Photography:
- The current recruitment process for Yellow Brook Photography takes approximately 90 days. It begins when a manager completes a requisition and sends it to the Human Resources Department. The Human Resources Department reviews and assigns a number to the requisition and returns it to the manager for approval. He or she approves it, obtains the required approval signatures, and then returns it to Human Resources.
 - Next, Human Resources creates a job posting and announces the position internally through the company's intranet, bulletin boards, or a binder of current job openings. Human Resources collects responses internally for eight days. After that, Human Resources solicits résumés from external sources by advertising in newspapers and

online. Human Resources then prescreens the résumés and forwards information on qualified candidates to the hiring manager for review. The hiring manager tells Human Resources which candidates should be interviewed. Human Resources conducts brief phone interviews of candidates recommended by the hiring manager; if the phone interview is promising, Human Resources schedules an on-site interview. Candidates interview with the hiring manager and with a Human Resources staff member. Human Resources records the interviews in an applicant flow log.

- Once a candidate is selected for hire, Human Resources and the hiring manager prepare an offer, and a background check on the candidate is initiated. Then, the hiring manager must approve the offer and obtain the required approval signatures on a job offer approval form. Subsequently, the hiring manager extends the offer verbally to the candidate, while Human Resources sends the written offer, including an employment start date. Once the applicant accepts the offer, a drug screening is scheduled for the candidate, who must also sign the offer letter and return it to Human Resources. At that point, Human Resources notifies the hiring manager of the candidate's acceptance. Finally, if the drug test comes back negative, the new employee completes new-hire orientation on the first day of work.

For Further Study and Research

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CHAPTER 8

RFID, BUSINESS INTELLIGENCE (BI), MOBILE COMPUTING, AND THE CLOUD

LEARNING OBJECTIVES

After completing this chapter, you will be able to:

- Define RFID and its role in logistics and sales
- Define business intelligence (BI), and provide examples of its uses
- Explain how in-memory computing will change the use of BI
- Discuss the importance of mobile applications to businesses
- Describe cloud computing and why it is becoming important for ERP providers
- Explain how the service-oriented architecture (SOA) concept has changed ERP development
- Describe Web services, and outline the unique components of NetWeaver
- Define software as a service (SaaS), and identify the advantages and disadvantages of using this software delivery model

INTRODUCTION

This chapter examines advanced topics relevant to Enterprise Resource Planning (ERP) systems.

As you have read in earlier chapters, an ERP system allows a company to accomplish tasks that cannot be done well, if at all, without such a system. Traditionally, ERP systems have been software applications that are run on a company's own computer systems, and the focus of ERP has been on managing business transactions. In this chapter, you will see how technologies such

as radio frequency identification (RFID) are increasing the amount of data that is contained in ERP systems, how business intelligence technologies are turning this data into valuable information, and how cloud computing and mobile technologies are changing where ERP data is stored and how it is delivered.

RADIO FREQUENCY IDENTIFICATION (RFID) TECHNOLOGY

Radio frequency identification technology, known commonly as RFID, is becoming an increasingly efficient tool for tracking items through a supply chain. An RFID device, which can be attached to products, is a small package (or *tag*) made up of a microprocessor and an antenna. The location of an item with an RFID tag can be determined using an RFID reader, which emits radio waves and receives signals back from the tag. The reader is also sometimes called an interrogator because it “interrogates” the tag. Because microprocessors have continued to become more powerful and less expensive over time, the cost of RFID technology is approaching a level at which it is becoming inexpensive enough to be cost-effective for many businesses. Today, most materials are still tracked using bar codes and bar-code readers. However, bar-code labels can degrade in bad weather, and an employee must point a bar-code reader directly at a bar code to read it. RFID technology does not need this line-of-sight connection, and can withstand most environmental stresses.

Walmart has been on the leading edge of the move to integrate RFID technology into the supply chain. In 2003, Walmart announced that it would require its top 100 suppliers to begin tagging pallets and cases with RFID tags, which would allow Walmart to more efficiently track products through its logistics network. (A Walmart-sponsored report from the University of Arkansas' Information Technology Research Institute concluded that RFID reduced retail out-of-stock situations in stores by 16 percent.) However, by early 2007 reports began to surface that Walmart's RFID initiative was not progressing as planned. Although Walmart publicly denied that it was experiencing any issues with its RFID technology, by October 2007, the company announced a major change in its RFID strategy, shifting its focus to the use of RFIDs in its stores rather than in its distribution centers. Unfortunately, Walmart still faced the reality that the cost for RFID tags was still too high to put on individual items, even though that is the area from which the biggest benefit would come. The major opportunity for RFID technology to reduce out-of-stock situations is not in the supply chain between the manufacturer and the storeroom at the individual store, but between the backroom stock area and the store shelves.

Walmart initiated its third RFID initiative in July 2010, announcing that it would begin requiring suppliers to place removable RFID smart tags on individual apparel items. According to Raul Vazquez, the executive in charge of Walmart stores in the western United States, the “ability to wave the wand and have a sense of all the products that are on the floor or in the backroom in seconds is something that we feel can really transform our business.” The potential return on investment of technologies that can improve

inventory accuracy is particularly high in a clothing retail setting, especially in terms of avoiding out-of-stock situations. A store may have 100 pairs of blue jeans on display racks, but if there is not a pair in a customer's size, then a sale is not possible. A 2007 pilot project at American Apparel Inc. resulted in sales increases of 14.3 percent in stores that using RFID technology. Garment-level RFID tags also have the potential to reduce employee theft by making it easier to check stockroom inventory and determine what items are missing.

Pharmaceutical firms are also evaluating the use of RFID technology to comply with requirements to combat counterfeit drugs. Regulatory agencies such as the FDA are developing rules that would require companies to track pharmaceutical products down to the package level. California is leading this trend with their ePedigree law that will take effect on a staggered basis from January 1, 2015, through July 1, 2017. An ePedigree is an electronic record that contains information regarding each transaction in the supply chain that results in a change of ownership of the given prescription drug, from initial manufacturer to returns from retailers. To accomplish this, manufacturers must create a unique serial number for the smallest package size that can be sold to a consumer.

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RFID technology is also being employed to track medical devices. For example, Spectrum Health's Meijer Heart Center is using RFID technology to track stents—wire mesh tubes that are implanted into weakened or narrowed cardiac arteries to keep them open. The Meijer Heart Center implants thousands of stents each year, and managing the inventory of stents is challenging. Stents are small, but can cost up to \$2,000 each. In addition, stents have an expiration date. In the past, manual systems were used to manage stents, a time-consuming process that was error prone. Inventory accuracy in the old system was 95 percent accurate—a figure that might sound good at first glance, but not when you consider that if the heart center handles 2,000 stents per year (at \$2,000 each), a 5 percent inventory error becomes a \$200,000 problem.

With the new system, stents are stored in RFID-enabled cabinets. Attached to each stent is an RFID tag, which provides it with a unique identification number. To withdraw a stent for use, a nurse swipes his or her ID card to a device attached to the cabinet. Through the device, the nurse can then access a list of patients in the hospital database. The nurse identifies the patient requiring the stent, and the cabinet unlocks. Then all the nurse has to do is remove the required stents from the cabinet; the RFID technology tracks which stents have been removed for the patient. In addition to tracking the removal of inventory, the system sends the information on the stents used to the hospital's information system for patient billing. The system also monitors inventory levels and triggers an order for new stents when necessary. If some of the stents that were removed for a patient are not used, the nurse can return the stents to the cabinet, and the RFID device will automatically credit the patient's account. The system also tracks expiration dates so employees can make sure those stents are used before their expiration date. With the new RFID cabinet system, Spectrum's inventory accuracy for stent inventory is now nearly 100 percent.

ANOTHER LOOK

RFID and Corporate Culture

American Apparel is a unique company even by the standards of the fashion industry. The company was founded in 1989 by Dov Charney, who started out in the clothing business as a college student selling t-shirts. Eventually, Charney built American Apparel into a vertically integrated fashion company that makes its clothing in Los Angeles rather than importing it from manufacturers in low-wage countries. In addition to manufacturing its own clothes, American Apparel designs its own garments, which it sells through a network of company-owned stores. The company also creates all of its advertising and marketing materials (which are known for generating heated controversy).

However, while the American Apparel was cultivating a hip image in the world of retail, it was also developing a reputation for being soft on shoplifting. Former employees allege that managers were asked to turn a blind eye to shoplifting so the “right type of person” would be wearing American Apparel clothing. In addition, lax internal controls over shipping and delivery combined with young store employees allegedly hired more for their looks than for their management ability led to high levels of employee theft. In an initial trial of RFID tags on garments in 2007, American Apparel found that inventory “shrinkage”—a reduction in inventory due to human error, theft, or damage—was 20 percent, double the retail industry average. Employee theft was clearly a significant portion of this high level of shrinkage.

While reducing theft is an important part of American Apparel’s RFID initiative, improved customer service is the primary goal. With RFID, American Apparel can use a continuous replenishment process to ensure on-shelf availability of their products. RFID also improves on-the-rack availability and inventory control at American Apparel by reducing mistaken identity. Many of American Apparel’s styles look similar, and manually inputting inventory data increases inventory accuracy problems. Stores with the RFID technology now have inventory accuracy above 99 percent, and in many stores, the RFID technology has paid for itself within 6 months, based on inventory cost savings. “We measure everything, and have accountability of every item. Every item counts, and when we change that culture, employees start treating products better,” says Stacey Shulman, American Apparel’s vice president of technology. On February 8, 2012, American Apparel reported that it intends to equip all of its 285 stores with RFID technology.

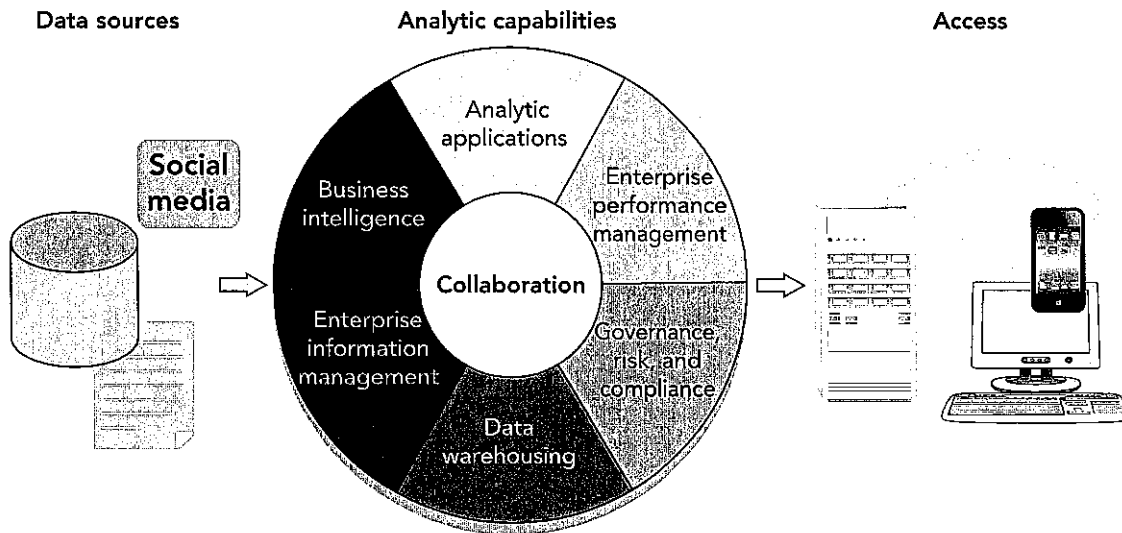
Questions:

1. RFID technology allows a company to more accurately track employee performance—from mistakes in inventory handling to theft. How would you feel about working at a company that used RFID technology to monitor your performance? Do you think this use of technology is good for a company’s culture?
2. In what other industries might RFID technology have an impact similar to that seen at American Apparel?

BUSINESS INTELLIGENCE/BUSINESS ANALYTICS

The combination of technologies such as RFID and mobile computing (described in the following section) with traditional ERP system data is providing companies with an exponential growth in business data. While this data plays a fundamental role in the day-to-day operations of a business, it also provides an opportunity for a company to perform sophisticated analyses to determine ways to improve its business. **Business intelligence (BI)**, also referred to as *business analytics*, is a term used to describe a range of different applications and technologies used to extract and analyze large amounts of data to aid in decision making. BI includes data-mining tools and querying tools, which are often interactive and visual. The growth of data-generating technologies such as RFID, combined with improvements in BI tools, has led to significant growth in the BI market. Prior to 2008, almost all of SAP's ERP business came from traditional ERP suite applications. However, in the period from 2008 to 2011, the percentage of the business that came from BI rose to 50 percent.

Figure 8-1 shows a framework for how SAP views BI.



Source Line: Course Technology/Cengage Learning.

FIGURE 8-1 SAP Business Intelligence (BI) framework

On the left side of the diagram are the potential BI data sources, which are growing both in number and in the volume of data produced. For example, sources such as Facebook, Twitter, and other social media applications can provide information on consumer reaction to new products.

The center section represents the analytical capabilities of BI; it includes items such as analytic applications and business intelligence, which are similar sets of data analysis tools. In SAP's framework, analytic applications are data analysis tools applied to specific

industries, such as financial services, manufacturing, consumer products, retail, and utilities or to functional areas, such as supply chain management, finance, human resources, IT, and service, sales, and marketing. SAP BI includes a set of tools for exploration, analysis, and presentation that can be applied to a wide range of business questions. Enterprise performance management is the concept of developing strategic goals for the organization and then gathering data to evaluate how the organization is performing in relation to those goals. The governance, risk, and compliance category represents a group of activities focused on ensuring an organization is functioning ethically and legally. Governance refers to the processes that ensure that top management is receiving accurate and timely data necessary to run the organization and that control mechanisms are in place to make sure that management directions and instructions are being carried out. Risk, or risk management, consists of processes to identify risks to the organization (technological, financial, information security, supply chain disruptions, and so on) and to develop plans to minimize the potential damage to these risks. Compliance means conforming to stated requirements, which could be customer specifications for goods or services, Sarbanes-Oxley reporting requirements (discussed in Chapter 5), or state and federal regulations such as those relating to product safety. Data warehousing is the technology used to store the large volumes of data used in the analysis. **Enterprise information management** is a relatively new term that describes the business and technology functions that manage information as a corporate asset.

The final section of the diagram in Figure 8-1 is titled “Access,” and it describes how users will access BI. Previously, this was primarily through personal computers, but with the growth in mobile technology, an increasing variety of devices can now be used to access BI.

IN-MEMORY COMPUTING

Up until recently, BI systems have typically accessed data that was stored on data warehouse servers, which use hard disk technology to store data. Data stored in data warehouse servers usually consist of aggregated data—from an ERP system or other sources. To speed access to this data, the data in a data warehouse are structured as **multidimensional data cubes**, which allow for relationships in the data to be analyzed quickly. For example, a company might want to look at sales over time, by store, and by product. This means analyzing sales along three dimensions, and the sales data would need to be structured as a three dimensional cube. If the company was also interested in looking at these sales by geographic region, it would need a four dimensional data cube.

There are two main challenges with using a multidimensional cube structure. First, a significant level of technical expertise is needed to construct a cube, which means that an IT specialist rather than an end user usually must complete this task. In practice, the end user and an IT specialist usually have to collaborate to construct the correct multidimensional data cube, and frequently they do not speak the same language—that is, the end user thinks in terms of business problems while the IT specialist thinks in terms of database technology. Second, the multidimensional cube is a structure that necessarily restricts how the data can be analyzed.

In Chapter 2, we introduced the topic of SAP’s HANA in-memory computing technology. HANA allows customers to analyze large amounts of data instantly. The key to this technology is that data is stored in computer memory rather than on hard disk servers.

Data compression is another technology that makes in-memory BI possible. Figure 8-2 shows data for an SAP ERP data table used to store material master data. This is a typical SAP ERP table; it consists of 223 data fields, which are the column headings.

Data Browser Table MARC Select Entries 200

[illegible]

Many columns are blank or have zero values

FIGURE 8-2 Material master data table

With the data compression provided by column storage, it is now feasible to store large volumes of data in memory without aggregation. This means that multidimensional cubes are not required. An end user can analyze BI data “on the fly” without needing an IT specialist to translate the data into multidimensional cubes.

SAP is not the only ERP provider with in-memory capability. In February 2012, Oracle released its in-memory solution for business analytics called Exalytics. Both SAP's and Oracle's in-memory solutions are designed to analyze what is now being termed "big data." Big data refers to the enormous amount of data that is now available for BI use from all the available sources, including ERP systems, Web sites, corporate databases, scientific research, Twitter, and other social networking applications. Big data needs fast computing to be usable, and in-memory computing allows for rapid processing. New chips designs, such as chips made from carbon rather than silicon, may be the answer to creating even faster machines. Computing's processing is moving towards memory and away from the processor, according to experts in the field such as John E. Kelly, the head of IBM research. Big data is generating a lot of interest and investments from large companies. The total investment in big data technology is in the billions of dollars, which includes investments by many companies other than SAP and Oracle, including IBM, Microsoft, and Hewlett-Packard.

Many feel that BI and its capabilities are strategic assets to an organization that can be used to enhance future growth and viability, and some experts now say that companies should be hiring a chief data officer who can link the data with the computing power and the strategy of the organization.

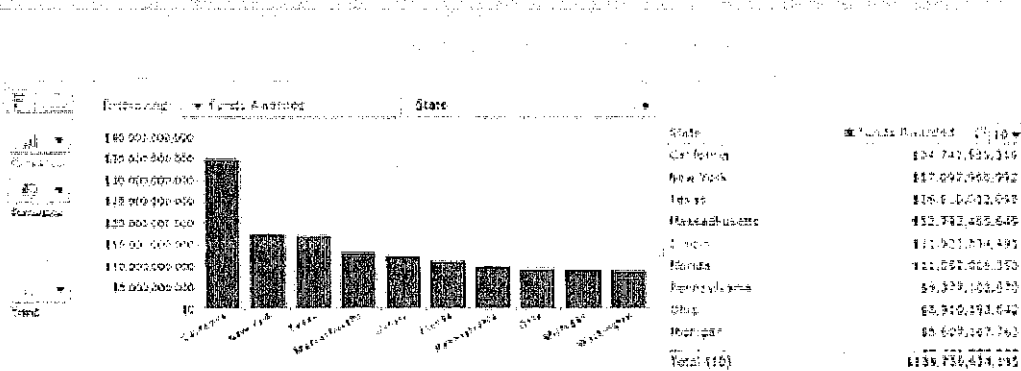
According to Gartner Research, in 2011, only 30 percent of employees in organizations with BI tools were actually using them. This low rate of use is due to the fact that BI software is often difficult to use and slow to perform, and the data is sometimes of limited relevance for end users. Gartner anticipates that as BI tools become easier to use, organizations with BI capabilities will have about 50 percent of their workers using the software by the year 2015. Worldwide revenue in the business intelligence, analytic applications, and performance management software market rose 16 percent to \$12.2 billion in 2011 from \$10.5 billion in 2010, according to a report from Gartner. SAP was the market leader in BI and analytics with a 24 percent market share. The report also showed that BI analytics was the top technology priority for CIOs in 2012.

ANOTHER LOOK

Recovery.gov

Even the federal government is getting into the BI arena. As part of the American Recovery and Reinvestment Act of 2009 (also known as the "Recovery Act"), the Recovery.gov Web site was created to serve as "the U.S. government's official website that provides easy access to data related to Recovery Act spending and allows for the reporting of potential fraud, waste, and abuse." With an interactive, user-friendly interface and a set of highly interactive BI tools, the site allows the average citizen to easily review the various destinations for tax dollars spent under the Recovery Act. The site's BI tools let users review preexisting charts and graphs or create their own. Filters are available for the data, and the results can be emailed or exported. Figure 8-3 shows a sample output of the top 10 states by funds awarded from the Recovery Act of 2009, as an example of a BI query.

(continued)



Source Line: Recovery.gov.

FIGURE 8-3 Recovery.gov's top 10 awards for states from the Recovery Act

Question:

1. Go to the Recovery.gov Web site, and run a set of analytics to compare Recovery Act spending for your state with that of a neighboring state. Determine the top three projects funded in each state, and provide a brief description of them in a memo to your instructor.

ANOTHER LOOK

Real-Time Business Intelligence (BI)

BI is now used for real-time monitoring of systems and is capable of sending out alerts based on the results of the BI. United Parcel Service (UPS) uses complex computerized event processing to monitor the transactions related to the millions of packages it ships daily around the globe. In its old system, reports would be run each evening to monitor the server loads on the computers that maintained these important transactions. If a problem occurred, UPS would find out about it the next morning. With real-time BI, which includes easy-to-understand dashboards and analytics, problems are identified immediately, and automatic emails are sent to alert employees of any problems with the company's computer systems.

Another example of the use of real-time BI is at Insurance.com, where its new IBM Cognos Now system helps the company cope with its e-commerce transactions. With Cognos Now, Insurance.com is able to monitor network performance and make any necessary changes immediately. For example, when a new call comes in to Insurance.com's call center, the business intelligence system scans for available agents and alerts the CRM software, which routes the call to one of the free agents.

Question:

1. How could real-time BI help an organization like Fitter monitor its IT systems? Be specific in your answer.

MOBILE COMPUTING

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With the sale of smartphones and tablet computers exceeding that of personal computers in 2011, many organizations are facing the necessity of developing and deploying their own mobile applications. Often these efforts are driven by the expectations of young workers who—having grown up with mobile computing and a myriad of mobile apps, such as Facebook—are appalled at some companies' existing legacy systems. It is predicted that by the year 2015, there will be more than 6.7 billion smartphones in the world, and a 2011 survey conducted by *CIO* magazine found that 54 percent of the companies responding were planning to increase their spending on mobile applications. People are relying on smartphones for social networking and shopping information, with the lines of work and play often blurred. With today's smartphone—40 times more powerful than those in 2000—and cloud computing (discussed in the next section) making data available wherever a person is, it is not surprising there is pressure on companies to increase their support of mobile apps.

There are, however, many challenges to face. For example, smartphones come in a wide range of formats and operate on a variety of operating systems, and mobile applications need to be developed with that in mind. Many experts agree that to develop effective applications, companies cannot simply take computer-based applications and modify them for use on mobile devices. Rather, mobile applications need to be developed from scratch to take into account the limitations in screen size and user input capability. Companies must also set up a road map for implementation, deciding which applications may be high cost and low value (eliminate) or low cost and high value (adopt). There are many questions to answer as well: Should a company require its employees to use company-supplied devices, or should employees be allowed to supply their own smartphones? If employees are allowed to use their own smartphone, should a company limit the choice of devices or allow employees to choose the device they will use? Accenture Consulting, for example, estimates that 85,000 of its employees use smartphones, of which more than one-half are provided by the individual employee. If an employee supplies his or her own device, who will support it? Which carrier will be used? Security is always a concern, especially because most security breaches are caused by users not by technology. It has been estimated that only slightly over one-half of all smartphone users set up their password security on their phones. If a company does not directly support a device it might not be able to ensure that proper security measures are taken, which could allow for potential data breaches. Some organizations are attempting to manage mobile devices from central servers, so if a device is lost or stolen, sensitive data can be removed or the device can be wiped clean.

ERP companies have provided mobile connections in the past, but most are ramping up their offerings. For example, SAP recently acquired Sybase, a company with a platform called Sybase Unwired, which lets a company quickly develop mobile apps for almost any mobile device. Another Sybase tool, Afaria, allows IT staff to manage those mobile apps centrally and push out new applications and updates remotely. If a device is lost or stolen, the central administrator can delete the application remotely.

Although mobile device apps are typically thought of as tools to provide users with information, mobile devices can also be the source of information. For example, the increasing sophistication of smartphones is leading people to use their smartphones—rather than dedicated GPS devices—for navigation. Smartphone users can also subscribe to traffic information services that may use static sensors or traffic cameras to augment the built-in maps so users can avoid accidents and rush-hour traffic. Increasingly, this

traffic information is also being provided by other smartphone users. For example, when a user of the Google Maps for mobile application chooses to enable the My Location option, which shows the user's location on the map, it sends anonymous bits of data back to Google describing how fast the user is moving. By combining the data of thousands of phones moving around a city at any given time, Google can provide an accurate picture of live traffic conditions. This traffic data is then provided to mobile users in the Google Maps traffic layers.

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Corporate and Military Apps

Companies are now using mobile applications (apps) in unique ways, and many companies are creating their own internal app stores. For example, the pharmaceutical company, Pfizer, has an app that helps employees who are traveling find and contact other Pfizer employees who are also traveling. Aflac, an insurance company, has an app that allows claims adjusters to see data and coordinate insurance claims on a mobile device without having to go to a computer and log onto the main enterprise system. For disaster recovery, Deloitte Consulting created an app called Bamboo, which can push emergency information out to employees' smartphones in the event of an emergency. Deloitte is implementing the app internally, and in the future, the firm plans to offer it to its customers.

The military is also a major potential user of specialized mobile devices and apps. Harris, an electronics and communications company is working on an app for tablet computers, such as Apple's iPad, to control the remote camera on an Unmanned Aerial Vehicle (UAV). While there are durability issues with using a commercial tablet in harsh environments, it could make economic sense to use a \$400 tablet in a rugged case instead of a \$10,000 wireless receiver. If a tablet breaks, it is much cheaper to replace. In addition, because these devices are familiar to many young soldiers from their personal experience, training costs are reduced.

In April 2011, Textron announced that the U.S. Army was beginning tests of SoldierEyes, a smartphone-based battle analysis and tracking system the company has been developing. According to Textron, this application would allow every soldier to act as a sensor. Using this application, soldiers could collect and report real-time mission critical data, incorporating photos and video, which can be linked to the geographic location of the soldier. With SoldierEyes, this information can be communicated (via the SoldierEyes Application Cloud) to existing command, control, communications, intelligence, and surveillance systems using 3G/4G cellular and Wi-Fi networks. For remote areas where these networks are not available, Textron has developed a secure mobile battlefield cellular network called FASTCOM, which can use manned and unmanned aircraft, aerostats (tethered blimps), or ground vehicles to provide cellular coverage.

Question:

1. Choose an industry in which you might eventually like to work. Think of three types of mobile apps that could be used to help you work more efficiently in that industry. Use the Internet to find out if those apps have been developed by any company. Present your findings in a one-page report to your instructor.

FROM INTERNET-ENABLED TO CLOUD COMPUTING

Cloud computing can be defined in simple terms as the delivery of a software product to a user via the Internet. The user typically accesses the cloud product through a Web browser or a lightweight (meaning small and simple) application for a computer or mobile device. Cloud computing is not a completely new concept, rather it simply represents the latest stage of the development of computing and the Internet. To better understand how cloud computing will impact ERP system development, it is useful to review the development of SAP's ERP systems with the advent of the Internet.

SAP and the Internet

In 1996, SAP introduced its joint Internet strategy with Microsoft. The core of SAP's first effort to integrate the Internet with its products was the Internet Transaction Server (ITS) a server-based software system that enabled efficient communication between an SAP ERP system and the Internet. To provide some context for the state of the Internet at this time—in 1996, Amazon.com was only one year old, and the online travel agencies Expedia and Travelocity were both just being founded. Many other Internet services we take for granted today did not exist at this time.

In May 1999, SAP announced mySAP.com, a new strategy designed to completely realign the company and its product portfolio. The goal of this initiative was to combine e-commerce solutions with SAP's existing ERP applications, using cutting-edge Web technology. In 2000, SAP began building on the mySAP.com vision by adding the capability for electronic marketplaces and corporate portals.

NetWeaver

In 2004, SAP introduced its first version of SAP NetWeaver, a collection of components that support business transactions over the Internet by providing seamless connectivity of diverse applications. By the end of the year, over 1,000 customers had acquired the product. With the introduction of NetWeaver, SAP announced that it was planning its future initiatives around the concept of enterprise **service-oriented architecture** (enterprise SOA), with a goal of making all of its business applications service based—to provide its customers with the most flexibility possible.

E-commerce needs are driving companies to connect their business applications, such as ERP systems, both internally and externally through the Internet. Software designed with an SOA can be quickly deployed and reconfigured as business conditions require changes to the applications, databases, and other infrastructure hosted in data centers owned by a company. The combination of software tools that enables an organization's various systems and applications to communicate with other applications is called **Web services**. SAP's NetWeaver is a Web services platform that allows various vendor applications to share data over the Internet.

Companies continue to warm to the idea of Web services and SOA. *Information Age's* "Effective IT" research report found that 50 percent of enterprises have some sort of SOA strategy. One benefit of adopting SOA is the ability to quickly add new applications, making the organization more responsive. SOA also relies on open standards, allowing easier integration of software and offering the potential to reuse computer code, which can reduce the time and cost of implementing new systems. This aspect of SOA is certainly enticing, especially when compared with traditional systems that are often cumbersome

and time consuming to implement. However, implementing SOA is not easy. The IT analyst group Ovum reported that one in five U.S. companies implementing SOA have experienced “unexpected complexity.”

The return on an SOA investment is often difficult to determine. According to a study published by Nucleus Research, only 37 percent of 106 organizations polled claimed that their SOA projects had a positive ROI. Respondents indicated that the main benefit of SOA was the ability to reuse computer code.

NetWeaver Tools and Capabilities

SAP's NetWeaver platform is a collection of modules, including Enterprise Portal, Mobile Infrastructure, Business Intelligence, Master Data Management, and Exchange Infrastructure.

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The SAP Enterprise Portal gives users complete access to all their work on a single screen, using links to connect users to all the major applications needed to perform their jobs. The Enterprise Portal acts as a central access point to a company's intranet (its secure, internal network), operating through a secure link on a browser. For example, a user in the Finance Department could set up Enterprise Portal with links to SAP ERP financial transaction processes, as well as links to financial metrics for the company, stock market indices, email, a calendar, and other information important for that person's job.

The advantage of having a personalized portal is its efficiency. A user only has to log on to one system to get all the information needed to perform his or her job. Without a portal, users often have to log on to multiple systems, such as an ERP system, email, industry exchanges, or suppliers' sites. Transferring information between systems is frequently difficult. With the Enterprise Portal, all information is available through the Web services provided by NetWeaver. All the important links are presented in one screen, and transferring data is simplified by the ability to “drag-and-relate” data from one area to another.

NetWeaver's Mobile Infrastructure module allows users to access and work with data through mobile devices such as smartphones and pagers. Mobile Infrastructure provides remote access to data within a company's SAP system and other information systems. The benefits are obvious. A salesperson could use his or her smartphone to see a customer's historical order information while in the middle of a sales call with that customer. Connecting SAP and VoiceObjects AG adds voice capability to NetWeaver, allowing users to enter data into the SAP CRM system using voice commands from their cell phones. Linking the SAP and VoiceObjects AG systems can be done without middleware or any changes to the software.

Another facet of NetWeaver is the linkage with SAP's Business Intelligence (BI) data warehouse and analytical tools. With the Enterprise Portal, BI can be delivered in a personalized fashion. It can integrate information from various sources and processes, both within and outside of the firm. BI works with any database management software and any operating system that is running NetWeaver.

Another NetWeaver module, Master Data Management, provides data consistency within a company's SAP system. NetWeaver allows a seamless Web interface to ensure proper data synchronization. While this interface simplifies the data synchronization process, it is not automatic—users with the proper knowledge and skills are still needed to manage this process.

NetWeaver's Exchange Infrastructure module allows different applications to share data. By adhering to the standard of the Exchange Infrastructure, companies can eliminate the need to write code to enable different applications to share data. For example, using Exchange Infrastructure, a business can keep its current electronic data interchange (EDI) system and seamlessly integrate that with its ERP system. SAP's Web Application Server, the development environment that is the foundation of NetWeaver, gives Exchange Infrastructure its customizability.

NetWeaver at Work for Fitter

Now we will examine how NetWeaver could help Fitter. Assume that Fitter has an SAP ERP system and that Fitter's two top salespeople, Amy Sanchez and Donald Brown, are busy selling NRG bars directly to customers and to distributors. Amy works from home, and she logs on to the SAP system with her laptop computer, using the SAP GUI. She does not know much about the SAP system, nor does she have to. She needs to know how to place customer orders and check on their status. When Amy goes on a sales call, she brings her calculator and notepad with her to determine quote prices and jot down order details. When she returns home, she plugs those numbers into the SAP system and confirms her quotes. Amy would like to have some additional information on how salespeople in other regions are doing and what mix of bars they are promoting, but she does not know how to access any of that information. She also would like to see if there are new ways to market to her customers.

Donald Brown sells Fitter's BRG bars to distributors, and he has been chosen by his manager to test SAP NetWeaver for possible implementation at Fitter. With this new capability, Donald's work day has changed dramatically. During the test, Donald logs on to his Enterprise Portal, which was tailored for his job, using his office computer. When he does so, he can see his email, sales figures from his top 10 customers, data on production and inventory, the current stock quote for Fitter on the NASDAQ exchange, the current market price for oats, wheat germ, and honey, and the local weather report. Today, Donald will make an important sales call for a regional grocery chain. He grabs his smartphone and some extra business cards, and heads out the door. During lunch with the purchasing manager for the grocery chain, Donald is able to check up-to-the-minute details on current sales orders and can confirm promises to ship additional bars to the customer next week, thanks to SAP's Mobile Infrastructure. Back at the office, Donald calls up the Business Intelligence module in NetWeaver. From there, he can run a few reports to find out which snack bars are selling best nationwide, grouped by region and time of year. He can also analyze snack bar sales using data mining, to find sales patterns that can help him plan future sales calls.

Exercise 8.1

1. Now that you have read about the features of SAP's NetWeaver and have learned how Amy Sanchez and Donald Brown perform their duties at Fitter, try to convince Fitter's CEO to implement NetWeaver across the organization. Write a memo to the CEO outlining your arguments.
2. The CEO is impressed with your work but has asked you for an ROI (return on investment) analysis. How would you begin doing that? What numbers do you need, and who are the people you would have to interview to get those numbers?

SAAS: SOFTWARE AS A SERVICE

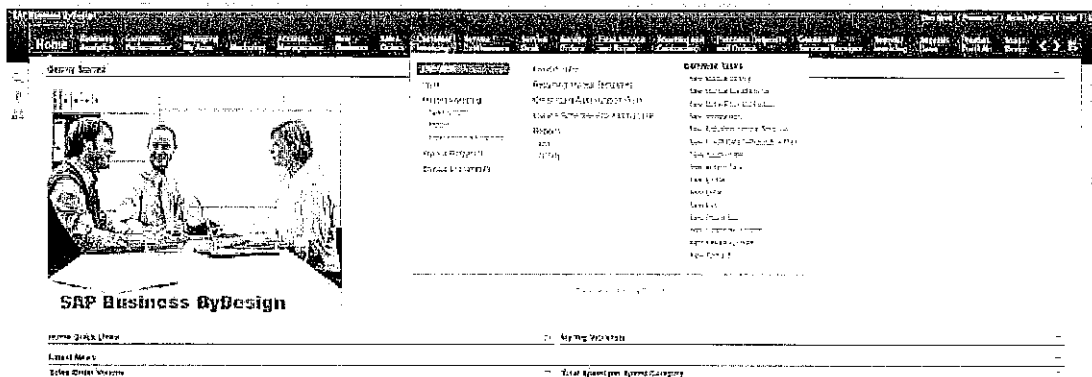
Software as a service (SaaS) is a software delivery model in which a software product is hosted by a company—such as SAP—on its servers and is accessed by customers via a Web browser. Some people describe SaaS as a utility, similar to a telephone or electric company. It is simply a way to sell and distribute software that uses the Internet. While definitions vary, this book treats SaaS as a subset of cloud computing. For example, Amazon and Apple are promoting data storage “on the cloud,” but the applications that use that data are stored on the device, updated regularly from the cloud (Internet).

A recent Forrester Research report claims that the analytics portion of SaaS will become highly important to the users of this software delivery model. Users will be also be looking for SaaS applications that can integrate social media with a company’s other sources of information. According to the report, adopters of SaaS should also consider how their service providers can handle mobile apps.

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SAP Business ByDesign

One example of SaaS for the ERP market is SAP’s Business ByDesign. First released in 2007, Business ByDesign is a full ERP system delivered to customers via the cloud. For small to medium-sized companies, it lowers the total cost of ownership of the software and enables a rapid and smooth implementation. Customers can choose to have SAP handle the implementation of Business ByDesign, or they can manage the implementation themselves. As shown in Figure 8-4, the main screen of BBD displays easy-to-understand menu paths.

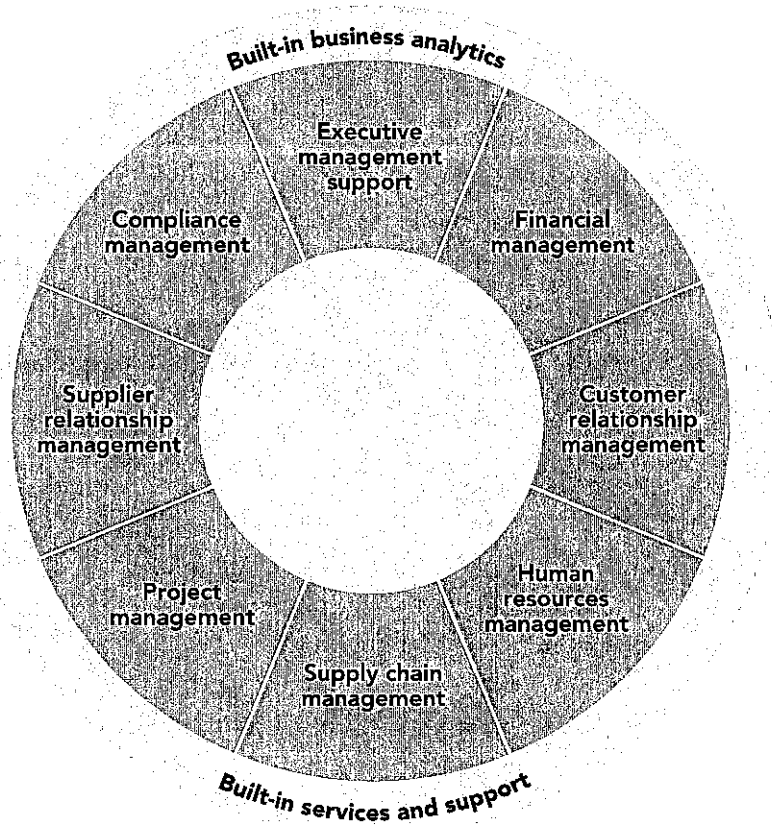


Source Line: SAP AG.

FIGURE 8-4 SAP Business ByDesign main screen

Small organizations such as PlaNet Finance, which offers microloans to customers in 30 international offices, often find that Business ByDesign is a good fit for their needs. With Business ByDesign, PlaNet was able to reduce its costs while improving reporting to donors. In terms of cost, the full Business ByDesign package will run a company about

\$90 per month per user. There are different facets of Business ByDesign, which are illustrated in the Figure 8-5.



Source Line: Course Technology/Cengage Learning.

FIGURE 8-5 SAP Business ByDesign's key capabilities

Advantages of Using SaaS

Many companies find a number of advantages with using the SaaS model, including:

- *Initial affordability*—Companies that previously could not afford to purchase an ERP system—or another application—can now “lease” one on a monthly basis, avoiding the high cost of obtaining the hardware and software and hiring and training support personnel, thereby reducing their TCO (total cost of ownership). The lower cost to implement software provided through SaaS means that companies can explore whether a particular software package will work for them without a large, up-front expense.
- *Shorter implementation time*—The time required for implementation is usually shorter with the SaaS model as the user does not have to worry about the technical issues; the provider has servers, telecommunications systems,

and highly trained personnel already in place. The SaaS provider handles all the maintenance, including execution of backups, training, and customizing of the system.

- *Lower support costs and complexity*—Companies that make use of the SaaS model do not need to hire additional IT personnel to implement new systems and applications. SaaS providers can also run information systems more efficiently because they do it on a large scale; they can spread fixed costs over many users, thus achieving economies of scale that translate into a lower total cost of ownership. In addition, an SaaS provider usually has an easier time attracting, training, and retaining a talented workforce than a small manufacturing company like Fitter.

Disadvantages of Using SaaS

There are some potential downsides to using SaaS, and companies should consider these carefully before choosing an SaaS provider:

- *Security*—Companies using SaaS are turning their information systems over to a third party. They must be confident that the SaaS provider has a high level of security. An SaaS provider will typically have data from multiple clients on a single piece of hardware. Each customer's data must be shielded from other customers. Although this is a legitimate area of concern for clients looking to move to the SaaS model, the reality is that SaaS providers often have better security systems in place than many small companies do.
- *Bandwidth/response time*—The telecommunications channel from the SaaS provider to its customers must be fast enough to handle multiple users, and the SaaS must have sufficient hardware to provide the necessary computer processing capabilities.
- *Flexibility*—The SaaS provider should be flexible in working with its users and satisfying their requests for software modifications and enhancements.
- *No frills*—SaaS software providers can usually provide basic systems well, but asking for unusual configurations may cause problems, and the SaaS provider might not allow for third-party add-ons. Further, the provider might not want to develop custom software, or it may not be affordable for a small company.
- *Technical, not business focus*—An SaaS provider will understand the technical aspects of the software it is delivering, but it may not have sufficient business process knowledge, in which case the customer will need to define the business processes and make configuration decisions.

ANOTHER LOOK

Plex Systems Cloud Community

Founded in 1995, Plex Systems developed out of a project initiated at an automotive supplier. The company has expanded its customer base and develops software for a variety of manufacturing companies. In particular, Plex provides a complete, cloud-based ERP solution for manufacturing companies. Plex moved to cloud computing in 2000 and developed its cloud strategy using the multi-tenant model versus a hosted environment. In a hosted environment, a separate system is created and managed for each customer, while in a multi-tenant model, there is only one system and each customer is a tenant in the system.

Plex chose this approach because it wanted to leverage customer enhancements. Because there is only one copy of the Plex system, whenever an improvement is made to it, the update is available to all tenants. Plex makes sure enhancements are designed to add functionality that might be valuable to multiple customers, but customers are not required to adopt every update. Customers can choose whether or not to adopt a change through simple configuration settings.

While manufacturing environments are complex, Plex decided that users needed a simple interface design for the shop floor. The simple interface makes the software easy to use. In addition, the interface is configurable so individual users can organize icons and buttons and control them with user authorizations as they are provided with Plex's screen building tool. A sample Plex screen is shown in Figure 8-6.

The screenshot displays the Plex Systems software interface. At the top, there is a navigation bar with tabs for 'Part List', 'Part Detail', 'Part History', and 'Part Setup'. The 'Part List' tab is active, showing a table with the following columns: Part No., Name, Part Type, Part Status, Attributes, Customer Part, and Users. The table contains several rows of data, including parts like '4799 AAA' and '4799 AAB'. Below the table, there is a detailed view of a specific part, showing its attributes and customer part information. The interface is designed for a shop floor environment, with a focus on simplicity and ease of use.

Source Line: Plex Systems.

FIGURE 8-6 Sample Plex screen

(continued)

Another unique feature of Plex's software is its pricing model. Many ERP companies price their software on a per-user basis. Plex saw a problem with this approach: it encouraged companies to limit the number of people who would interact with the software. Plex, however, wanted to encourage customers to use software. In addition, the company wanted to match its pricing to the real costs of transactions processed. In a seat license model, a customer may minimize users but have the same volume of transactions as a customer with many more users. Plex prices its software based on the size of the business, whether measured by company revenue or total number of employees. Plex adjusts the amount of the subscription on a yearly cycle. If a company suffers a downturn in business—and its revenue or number of employees is reduced—then its subscription is reduced. Of course, if the customer grows, so does its subscription.

Plex has observed an interesting phenomenon with its customers. At first, new customers are hesitant to use a cloud system—they are concerned about data integrity when all customers reside in a single system. But after a while, customers typically realize that other Plex customers actually form a community, and collaboration within the Plex community provides value. Rather than being a software company that is sales and marketing driven, Plex has become a company where users, and the user community, directly drive innovation, and all customers benefit.

Questions:

1. How will SaaS affect large ERP companies such as SAP and Oracle? Will their size and research capabilities allow SAP and Oracle to gain dominance of the SaaS marketplace, or will ERP systems be provided by a growing number of small companies, such as Plex, each providing specialized ERP packages specially tailored for specific industries?
2. Will Fortune 500 companies eventually leave SAP ERP for SaaS systems? Will they adopt SaaS products from smaller providers? Will they use Business ByDesign? Or will companies like SAP and Oracle migrate their current large ERP packages to an SaaS environment?

Exercise 8.2

Returning to the example company, Fitter, assume that under its newly appointed CIO, Fitter has made the decision to acquire an ERP system. Now the CIO must decide how to implement the system. After talking with various ERP software vendors, the CIO has determined that Fitter has two options for implementing ERP software:

1. Buy a license for the ERP software, purchase the hardware required to run it, and hire and train system administrators.
2. Run Fitter's ERP system over the Web through an SaaS provider, which would deliver ERP services for a monthly fee.

Both types of implementations have advantages and disadvantages, as you have already seen. For the first part of this exercise, you must write a memo to the CIO enumerating the pros and cons of each method. Use a table similar to the one shown in Figure 8-7 to organize your thoughts.

Advantages of purchasing software and computers for ERP	Advantages of using SaaS to run ERP

Source Line: Course Technology/Cengage Learning.

FIGURE 8-7 Arguments for purchasing ERP system and software versus using SaaS

After reviewing your memo, the CIO has asked you to provide some financial data to help him make a decision. He would like you to prepare a spreadsheet that analyzes the financial impact of both scenarios. You need to compare the monthly cost of using the SaaS provider with the total cost of purchasing an ERP system that would run on Fitter's servers. Weigh the pros and cons of each method, and then make a recommendation, which the CIO will present to the chief financial officer of Fitter. As you work through these calculations, keep in mind that Fitter's net income is \$3.4 million (you can find more details in Chapter 5). The following sections provide you the financial details you should take into consideration.

Option 1: Buying Computers and Software Rights for an ERP System

To set up its own ERP system, Fitter must buy the following:

- *Database server*—The server would cost \$70,000.
- *Application server*—Fitter needs a server to run the ERP application, which would cost about \$40,000.
- *PCs*—Some of Fitter's existing PCs could be loaded with the ERP software's GUI and be used to access the system. Because more Fitter employees will be connected to the new system, however, Fitter will need 10 additional computers. Total cost for the PCs would be \$15,000.
- *Computer maintenance*—Fitter needs to make sure all its PCs and servers run properly. To do this, Fitter would purchase a maintenance contract to cover all hardware. This contract would cost about \$1,000 a month, or \$12,000 yearly, and is in addition to any costs Fitter currently incurs to maintain its existing hardware.
- *Licensing rights*—Licensing rights to the ERP software for all users for five years would cost \$500,000. The CIO does not know whether further outlays will be required after the fifth year, and therefore is limiting the analysis to the years 2013 through 2017.
- *Installation*—The ERP vendor will help install the system, but Fitter also needs to hire consultants for the six-month implementation. At \$3,000 per day, the cost is estimated at \$486,000.
- *User training*—Included with the purchase of the rights to the ERP software is training at a local training center for key personnel involved in the ERP implementation project. Fitter wants further training, however, for Fitter-specific business practices. The additional training will cost \$2,000 per day

for two weeks. This includes a training consultant to run classes at Fitter headquarters. With travel and lodging, the total cost is \$23,000.

- *Ongoing consulting*—Once the system is up and running, Fitter will need to pay for consultants to help maintain the system. Fitter believes that having consultants come in once a month should be sufficient for handling ongoing issues such as bug resolution and minor updates to the system. The consulting fees are estimated to be \$3,000 per day, with a total annual cost of \$36,000.
- *Network and database administrator*—Fitter would need a full-time network and database administrator to run the system. Salary, including benefits, for a skilled person is \$200,000 per year.

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Option 2: Using an SaaS Provider to Deliver ERP Software

The other option available to Fitter is to use an SaaS provider to deliver ERP software. Estimated costs for this option are as follows:

- *PCs*—Fitter estimates that it would still need to purchase 10 new PCs with this option because many more users will now be accessing the computer system. Each PC costs \$1,500, for a total of \$15,000.
- *Computer maintenance*—The maintenance contract on the additional PCs would be \$600 per month, or \$7,200 yearly. Because Fitter would not need to purchase additional servers, the maintenance costs are less with this option.
- *Software through the SaaS provider*—The monthly cost of delivering ERP software to Fitter over the Web is \$33,333—or \$400,000 yearly.
- *User training*—Training of Fitter employees is provided by the SaaS provider as part of the monthly software fee.

Calculate the NPV and Make a Recommendation

In the next part of this exercise, you will set up a spreadsheet to total all the costs of each option. In each scenario, you must deal with the net present value (NPV) of money.

NPV is a way to figure out whether an investment is profitable, or in this case, to compare outlay of funds from one method to another. NPV addresses the time value of money—that is, being paid one dollar today is worth more than being paid one dollar a year from now. Because of the time value of money, if a firm is borrowing the money for an investment, they have to pay interest on that money. If they have cash on hand to finance the investment, the company still needs to consider that the cash could be invested in other ways that would pay the firm interest. When analyzing an investment, a firm must consider the time value of money, and performing a NPV calculation is a common way to do that by adjusting future earning or expenses based on an assumed interest rate. When calculating two different investment options, the NPV calculation allows different future expenses or earnings to be calculated as an equivalent amount in the present time. For example, earning \$10,000 dollars one year from now might be equivalent to having \$9,345.79 today. NPV can be calculated over a number of years; in our case, we need a five-year outlay of funds for the ERP project. In an Excel spreadsheet, the syntax of the NPV calculation is `=NPV(hurdle rate percentage, range of values)`. The values in the range can be positive or negative numbers. In our case, they are all outflows,

but we can work with them as positive numbers. The hurdle rate is the rate of discount over the period, and it is the minimum acceptable rate of return on a project that a company will accept. For this example, assume a hurdle rate of 20 percent.

Your spreadsheet should begin like the one shown in Figure 8-8 (with years continuing through 2017).

ERP Purchasing Options						
Option 1 - Buying computers and software outright						
Items		2013	2014	2015	2016	2017
Database server		70000				
Application server		40000				
10 PCs		15000				
Software		500000				
Consultants - initial (6 months)		486000				
Training (2 weeks)		23000				
Consultants - maintenance (1 day per month)			36000	36000	36000	36000
PC maintenance			12000	12000	12000	12000
Network administrator		200000	200000	200000	200000	200000
Total		1334000	248000	248000	248000	248000
NPV		\$1,646,671.81				
Option 2 - Using SaaS						
PCs		15000				
PC maintenance			7200	7200	7200	7200
ASP cost		400000	400000	400000	400000	400000
Total		415000	407200	407200	407200	407200
NPV		\$1,224,277.26				
Hurdle rate		20%				

Source Line: Course Technology/Cengage Learning.

FIGURE 8-8 Cost comparisons: buying versus SaaS

To complete this part of the exercise, perform the steps that follow:

1. Calculate the cost of the two methods of implementing an ERP system for five years. Use the spreadsheet illustrated in Figure 8-8 as your guide. Use the NPV calculations to reference the hurdle rate shown at the bottom of the spreadsheet. Vary the hurdle rate, following the directions your instructor provides.
2. Consider using different hurdle rates for each option. Why might varying hurdle rates be applicable for this decision?
3. Write a memo, with your spreadsheet attached, to the CIO. Answer this question: Which method should Fitter choose, and why? Weigh the pros and cons of each method, and make a recommendation, which the CIO will present to the chief financial officer of Fitter. Be sure to consider both the qualitative aspects and the quantitative aspects of the choice.

Your instructor might assign the following additional exercises:

1. Use the Internet or library resources to research the use of SaaS providers. Find cases of companies that have been successful in using an ERP system through an SaaS provider. Describe one success story in a report to your instructor.
2. Think about whether you would give different advice to a smaller company than you would to a medium-sized company or to a large company, regarding the use of SaaS providers. Why?

Chapter Summary

- Technologies such as radio frequency identification (RFID) and smartphones are fueling explosive growth in the amount of data available for businesses to process. This data can provide real business value, but the challenge is how to manage and evaluate this data to gain business knowledge.
- Business intelligence (BI) tools are growing in sophistication and power. Technologies such as in-memory computing will provide greater speed and flexibility to BI users and will increase the number of employees in a company that can make use of BI.
- Mobile computing technology is increasing the use of ERP and BI data by making it more convenient to access data when and where it is needed.
- Cloud computing is the delivery of a software product to a user via the Internet. The user typically accesses the cloud product through a Web browser or a lightweight (meaning small and simple) application for a computer or mobile device.
- Web services and service-oriented architecture offer a combination of software tools that enables various programs within an organization to communicate with other applications.
- SAP's Web services platform is NetWeaver, which is a collection of components that support business transactions over the Internet by providing seamless connectivity of diverse applications through the Internet. NetWeaver also includes modules such as Enterprise Portal, Mobile Infrastructure, Business Intelligence, Master Data Management, and Exchange Infrastructure.
- Software as a service (SaaS) is a software delivery model in which a software product is hosted by a company—such as SAP—on its servers and is accessed by customers via a Web browser. The SaaS model allows companies to use ERP without a large initial investment, making ERP systems available to smaller companies. SaaS solutions allow for more rapid improvements in the software through user communities. There are risks associated with using an SaaS provider, however, and the decision to buy or lease must be weighed carefully.

Key Terms

business intelligence (BI)	radio frequency identification (RFID)
cloud computing	service-oriented architecture (SOA)
enterprise information management	software as a service (SaaS)
multidimensional data cubes	Web services

Exercises

1. Assume you have just graduated and you have landed a job at Fitter as its new sales manager. The person you replaced has just retired after 35 years in the job. You are eager to put to use some of the skills you learned at school, especially the work you did on mobile computing and SaaS. Write a memo to your new boss, the vice president of Marketing and Sales, on the virtues of SaaS and mobile computing, and explain why Fitter

should develop a plan to adopt a mobile strategy for managing sales using SaaS through mobile devices.

2. Do some research on the Internet to find current opinions on the pros and cons of using SaaS. Try to find some examples of success and failure stories. Under what circumstances do you think using an SaaS makes sense?
3. List the advantages of using mobile devices from the point of view of a Fitter salesperson. Next, list the challenges of developing and supporting those mobile applications from the point of view of Fitter's IT staff. Assume the company is hosting its own ERP system. What should the company's strategy be? Why?
4. In-memory computing technology is changing the face of BI. Create a PowerPoint presentation that brings the Fitter crew up to speed on this emerging technology.
5. Research the current status of mobile applications for phones and tablets in the corporate world. Write a two-page summary of how these applications are being used, and cite specific examples. Be sure to include your references with the summary.
6. Using the library or Internet sources, write an update on the status of FDA legislation surrounding RFID packaging on drugs. Are there any privacy concerns?

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