Chapter 14

Managing Projects

LEARNING OBJECTIVES

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

1. What are the objectives of project management and why is it so essential in developing information systems?
2. What methods can be used for selecting and evaluating information systems projects and aligning them with the firm's business goals?
3. How can firms assess the business value of information systems projects?
4. What are the principal risk factors in information systems projects?
5. What strategies are useful for managing project risk and system implementation?

Interactive Sessions:

Austin Energy's Billing System Can't Light Up

Westinghouse Electric Takes on the Risks of a "Big Bang" Project

CHAPTER OUTLINE

NU SKIN'S NEW HUMAN RESOURCES SYSTEM PROJECT PUTS PEOPLE FIRST

Nu Skin Enterprises is an American direct-selling and multilevel marketing company which sells more than 200 anti-aging personal care and dietary supplements products through more than 830,000 independent distributors. Since its beginnings in 1984 in Provo, Utah, the company has expanded operations to 52 international markets. Annual revenues have topped 1 billion dollars.

Nu Skin's business model combines direct selling with multilevel marketing. Each distributor markets products directly to potential customers, and can also recruit and train customers to become distributors. Distributors are paid from the retail markup on products they are able to sell personally, as well as a percentage of the sales of distributors they have recruited. To be successful, Nu Skin obviously must pay close attention to how it manages people.

Although Nu Skin has nearly 6,000 employees in 28 different countries, until recently, it did not have a centralized human resources (HR) system to maintain employee data or to provide HR reporting to other parts of the business. Instead, it managed employees manually at the local level or allowed local operating units to use their own systems. In order to obtain employee information at the corporate level, Nu Skin had to contact the region and obtain the data manually. All of this was very time-consuming, and the company really needed more consistent and automated HR processes.

When Nu Skin's management decided to implement a centralized HR system, a cross-functional project team representing human resources and the information systems department conducted a thorough two-year analysis of information needs and searched for the right system. It recommended SAP ERP Human Capital Management (HCM), and started to implement the modules for personnel administration and organizational management.

Members of the project team were selected so that their HR expertise and experience would complement each other. Team members included several SAP business analysts, a programmer analyst, a technical business analyst, an HR information systems analyst, and a team of senior systems engineers. Vice President of Human Resources David Daines and IT Business Integration leaders Amy Camara and Jay Barney supported the team.

External consultants from Symphony Consulting were hired to assist the project team in identifying information requirements from various Nu Skin offices. Consultants were hired on the basis of skills and personality that would enhance the team, as well as the ability to perform on-site training. Nu Skin's users were in so many different geographic locations that it would be impossible for them to train in the new system off-site. The consultants were assigned to train employees on-site during the implementation.

Through every step of the project, the company was careful to put "people" before technology. What kind of people should be on the project team? What consultants should be employed? What are the business and culture requirements that have to be addressed?

The project team visited various Nu Skin sites in each of the company's markets to inquire about the data each

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collected, what systems and reports they used with the data, and what they wanted in the future. These face-to-face meetings sensitized the project team to the regional differences in information requirements and corporate culture. The meetings also gave end users a stronger sense of ownership in the project and the belief that the project team was dedicated to making the new system work for their benefit.

The project team used a phased implementation approach for each global region. In 2011, Nu Skin went live with the SAP ERP HCM global functionality. Benefits were immediate. In the past, if the finance department needed a report on the number of full-time employees in a specific market, the Nu Skin HR department had to request the information from the local operating unit, which could take weeks. A report about which employees transferred to another department or left the company had to be manually created by gathering the required data from the various regions and manually sending the report to the different departments. Now all of these reports are automatically generated and distributed by the system.

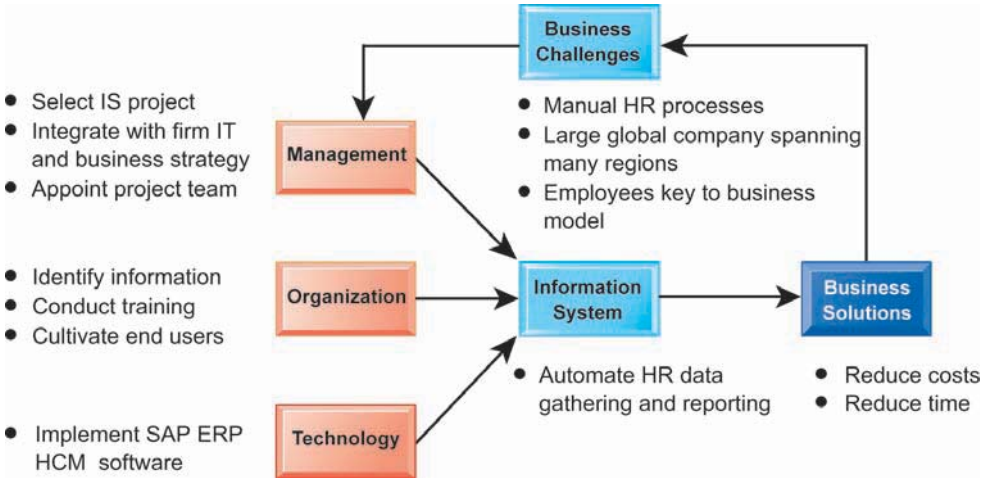
Sources: "Nu Skin Fights Aging Systems with New HR Software,"SAP Insider Profiles January 2012; "Nu Skin: Invigorating the Customer Interaction Experience," www.sap.com, accessed November 8, 2012; and www.nuskin.com, accessed November 8, 2012.

One of the principal challenges posed by information systems is ensuring they deliver genuine business benefits. There is a very high failure rate among information systems projects because organizations have incorrectly assessed their business value or because firms have failed to manage the organizational change surrounding the introduction of new technology.

Nu Skin's management realized this when it implemented its HR system. The new system involved an enterprise-wide change in HR business processes supported by new software. Nu Skin succeeded in this project because its management clearly understood that attention to organizational "people" issues was essential for success, especially in a multinational company with numerous regional and cultural differences.

The chapter-opening diagram calls attention to important points raised by this case and this chapter. Nu Skin desperately needed to automate its HR processes, which had been entirely manual and made operations highly inefficient. Management wisely selected a project team whose members had both business and technical expertise. The team took great care and time to identify the right software solution and to elicit user information requirements. Staging the system implementation and conducting employee training at each location further contributed to success.

Here are some questions to think about: Why was it important to have representatives from both HR and IT on the project team? What were the risk factors in this project?



14.1 The Importance of Project Management

There is a very high failure rate among information systems projects. In nearly every organization, information systems projects take much more time and money to implement than originally anticipated or the completed system does not work properly. When an information system does not meet expectations or costs too much to develop, companies may not realize any benefit from their information system investment, and the system may not be able to solve the problems for which it was intended. The development of a new system must be carefully managed and orchestrated, and the way a project is executed is likely to be the most important factor influencing its outcome. That's why it's essential to have some knowledge about managing information systems projects and the reasons why they succeed or fail.

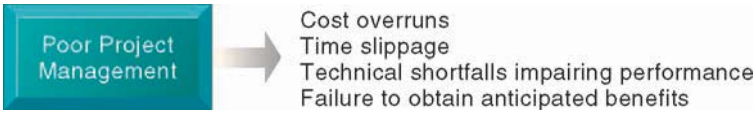
RUNAWAY PROJECTS AND SYSTEM FAILURE

How badly are projects managed? On average, private sector projects are underestimated by one-half in terms of budget and time required to deliver the complete system promised in the system plan. Many projects are delivered with missing functionality (promised for delivery in later versions). The Standish Group consultancy, which monitors IT project success rates, found that only 32 percent of all technology investments were completed on time, on budget, and with all features and functions originally specified (McCafferty, 2010). A large global study of 1,471 IT projects reported in *Harvard Business Review* found that the average cost overrun was 27 percent, and that one in six of the projects studied had an average cost overrun of 200 percent and a schedule overrun of almost 70 percent (Flyvbjerg and Budzier, 2011). Between 30 and 40 percent of all software projects are "runaway" projects that far exceed the original schedule and budget projections and fail to perform as originally specified.

As illustrated in Figure 14.1, a systems development project without proper management will most likely suffer these consequences:

- Costs that vastly exceed budgets
- Unexpected time slippage
- Technical performance that is less than expected
- Failure to obtain anticipated benefits

FIGURE 14.1 CONSEQUENCES OF POOR PROJECT MANAGEMENT



Without proper management, a systems development project takes longer to complete and most often exceeds the allocated budget. The resulting information system most likely is technically inferior and may not be able to demonstrate any benefits to the organization.

The systems produced by failed information projects are often not used in the way they were intended, or they are not used at all. Users often have to develop parallel manual systems to make these systems work.

The actual design of the system may fail to capture essential business requirements or improve organizational performance. Information may not be provided quickly enough to be helpful, it may be in a format that is impossible to digest and use, or it may represent the wrong pieces of data.

The way in which nontechnical business users must interact with the system may be excessively complicated and discouraging. A system may be designed with a poor user interface. The **user interface** is the part of the system with which end users interact. For example, an online input form or data entry screen may be so poorly arranged that no one wants to submit data or request information. System outputs may be displayed in a format that is too difficult to comprehend.

Web sites may discourage visitors from exploring further if the Web pages are cluttered and poorly arranged, if users cannot easily find the information they are seeking, or if it takes too long to access and display the Web page on the user's computer.

Additionally, the data in the system may have a high level of inaccuracy or inconsistency. The information in certain fields may be erroneous or ambiguous, or it may not be organized properly for business purposes. Information required for a specific business function may be inaccessible because the data are incomplete.

The Interactive Session on Management illustrates some of the problems we have just described. As you read this case, try to determine why this project was not successful and the role of project management in the outcome.

PROJECT MANAGEMENT OBJECTIVES

A **project** is a planned series of related activities for achieving a specific business objective. Information systems projects include the development of new information systems, enhancement of existing systems, or upgrade or replacement of the firm's information technology (IT) infrastructure.

Project management refers to the application of knowledge, skills, tools, and techniques to achieve specific targets within specified budget and time constraints. Project management activities include planning the work, assessing risk, estimating resources required to accomplish the work, organizing the work, acquiring human and material resources, assigning tasks, directing activities, controlling project execution, reporting progress, and analyzing the results. As in other areas of business, project management for information systems must deal with five major variables: scope, time, cost, quality, and risk.

INTERACTIVE SESSION: MANAGEMENT

AUSTIN ENERGY'S BILLING SYSTEM CAN'T LIGHT UP

Austin Energy handles electrical, water, and waste disposal for the City of Austin, Texas, and surrounding counties, serving more than 1 million residents. It is a publicly owned company and an arm of city government, and returns its profits to the community each year. The company has provided $1.5 billion in dividends back to Austin since 1976, which help fund city services such as fire, police, emergency medical services, parks, and libraries.

Austin Energy has one of the largest renewable energy programs in the country, but its legacy billing systems did not integrate with smart meters and other newer technologies. It also lacked newer customer assistance options, like the ability to choose the time of the month that a customer prefers to pay bills. To modernize the billing system and to bring its information systems up to date with newer energy conservation methods, Austin Energy contracted with IBM in 2009 to create a centralized billing system and to run the system for five years. Austin agreed to pay IBM $55 million, with $38 million allocated for building and installing the new billing system, and $17 million for operating the system for five years after its completion. The new billing system was slated to handle electricity, water, trash, and recycling. Austin was optimistic that a successful installation would eventually pay for itself in savings.

To date, the project has been a disappointment at best. The system was supposed to go live in early 2011, but is still not fully operational. Software bugs have led to errors in thousands of bills. Over 65,000 customers never received a bill, and another 35,000 have received inaccurate bills. For example, one business that owed Austin Energy $3,000 was instead charged $300,000. Although Austin Energy was able to identify affected accounts and work with customers individually to correct the problems, the company was ill-prepared to handle the outpouring of customer dissatisfaction with the new system, and their customer service department was in danger of being overrun.

According to Austin Energy manager Larry Weiss, "Instability issues . . . continue to have serious and costly impacts on our business and our customers." Persistent system errors prevented the company from billing apartment residents for water, balancing its books, and filing audit reports. Without the ability to bill for utilities properly, the City of Austin was losing revenue.

Officials with Austin Energy put the blame for the project's woes squarely on IBM. Austin Energy's CIO Alan Claypool stated in an interview that "we have yet to reach a stable system (and) we are extremely disappointed and continue to have serious concerns about the quality of service we have received from IBM to date." He noted in a September 2011 message that IBM was repeating mistakes as it tried to implement the system. Two separate errors by IBM cost the project 37 hours of delay, and one of the errors was the same type of error made by the same team in December 2010. "We continue to be gravely disappointed in the delays and seemingly ad hoc methods toward managing this project," Claypool stated.

The company now plans to include provisions in future contracts with IBM that guard against similar mishaps, with a particular focus on system availability, and Austin is withholding $3.8 million in payments currently owed to IBM until the system meets baseline performance benchmarks.

Claypool and other Austin Energy executives have made numerous direct appeals to IBM officials, ranging from the managers of the billing system project all the way up to then IBM CEO Sam Palmisano. Claypool first wrote directly to Marc Lautenbach, the head of IBM's Global Business Services unit in North America, which was responsible for the billing system project. He explained that thousands of customers required one-on-one assistance to access their accounts or correct billing errors. Lautenbach was then replaced as Global Business head by Frank Kern, who wrote back to Austin and described a five-step plan to fix the problems with the billing system.

Kern's plan was to improve communications on business impacts caused by known defects, to ensure that problems with the system are delegated to the correct people, to implement best-practice processes to ensure repeatable success, to work more closely with third-party vendors like Oracle, and to identify gaps outside the project's scope and recommend solutions. Since that time, Kern has retired, and Claypool wrote back to IBM yet again to report that no progress had been made since the five-step plan was first developed for Austin Energy's billing system. Austin Energy officials also objected to IBM's suggestion to add more powerful servers to help fix

the problem because that would force the utility to pay more than originally planned on the project.

Despite all of the blunders, Austin Energy continues to hold out hope for a successful and amicable solution to the problem. Austin Energy has a relationship with IBM dating back several years, when the companies contracted together to develop an inventory management system for the city. Though that system also experienced problems, they pale in comparison to the billing system fiasco. Austin Energy also claims that IBM's errors have cost the company $8 million since the project's outset, so switching vendors might simply make matters worse for Austin Energy with so much invested in IBM's project development already. When asked for comment, IBM has only said that it is working with Austin Energy to resolve the billing system issues.

IBM has successfully managed other projects like this one in the past. The IBM billing system consists of Oracle databases running atop IBM's WebSphere middleware and Tivoli management tools. The problems with the system have not stemmed from one root cause. The new billing system is complex, with 73 different interfaces, and getting them all to work seamlessly with one another has been an arduous process. Customers have been unable to access the system's online portal, and Austin Energy employees have described their experience with the system as if they are "alpha testers," meaning they have encountered bugs and issues that should never have made it to a live version.

Roughly one in four Austin customers has had problems with IBM's system. Some customers had their accounts canceled and could only correct the errors after several phone calls. The billing system woes have come at a bad time for Austin Energy, which was preparing to institute its first rate increase in 17 years. In the wake of the public relations disaster brought about by the botched billing system, the company has had to rethink those plans.

As of February 2012, most—but not all—of the billing system errors had been fixed. Claypool remained hopeful that Austin Energy would be able to maintain an amicable relationship with IBM and finish the work successfully. IBM has been responsive, Claypool noted, but Claypool felt its response was too "incremental. . . . We would like to see a faster response." Going forward, Austin Energy's outsourcing contracts will include stronger penalties for vendor nonperformance, including the question of system availability.

Sources: Paul McDougall, "Chronology of an Outsourcing Disaster," *Information Week*, February 23, 2012; "Austin Energy Fixes Billing System Bug," MyFoxAustin.com, February 22, 2012; and www.austinenergy.com, accessed March 22, 2012.

CASE STUDY QUESTIONS

1. Is the Austin Energy project a failure? Explain your answer.
2. Describe the business impact of the faltering Austin Energy project.
3. To what degree was IBM responsible for the problems countered by the Austin Energy billing project? Was Austin Energy at fault for the problems? Explain your answer.
4. What were the specific organizational or technical factors as well as management factors involved in this project failure?
5. Describe the steps Austin Energy and IBM should have taken to better manage this project.

Scope defines what work is or is not included in a project. For example, the scope of a project for a new order processing system might be to include new modules for inputting orders and transmitting them to production and accounting but not any changes to related accounts receivable, manufacturing, distribution, or inventory control systems. Project management defines all the work required to complete a project successfully, and should ensure that the scope of a project does not expand beyond what was originally intended.

Time is the amount of time required to complete the project. Project management typically establishes the amount of time required to complete major components of a project. Each of these components is further broken down into activities and tasks. Project management tries to determine the time required to complete each task and establish a schedule for completing the work.

Cost is based on the time to complete a project multiplied by the cost of human resources required to complete the project. Information systems project costs also include the cost of hardware, software, and work space. Project management develops a budget for the project and monitors ongoing project expenses.

Quality is an indicator of how well the end result of a project satisfies the objectives specified by management. The quality of information systems projects usually boils down to improved organizational performance and decision making. Quality also considers the accuracy and timeliness of information produced by the new system and ease of use.

Risk refers to potential problems that would threaten the success of a project. These potential problems might prevent a project from achieving its objectives by increasing time and cost, lowering the quality of project outputs, or preventing the project from being completed altogether. Section 14.4 describes the most important risk factors for information systems.

14.2 Selecting Projects

Companies typically are presented with many different projects for solving problems and improving performance. There are far more ideas for systems projects than there are resources. Firms will need to select from this group the projects that promise the greatest benefit to the business. Obviously, the firm's overall business strategy should drive project selection. How should managers choose among all the options?

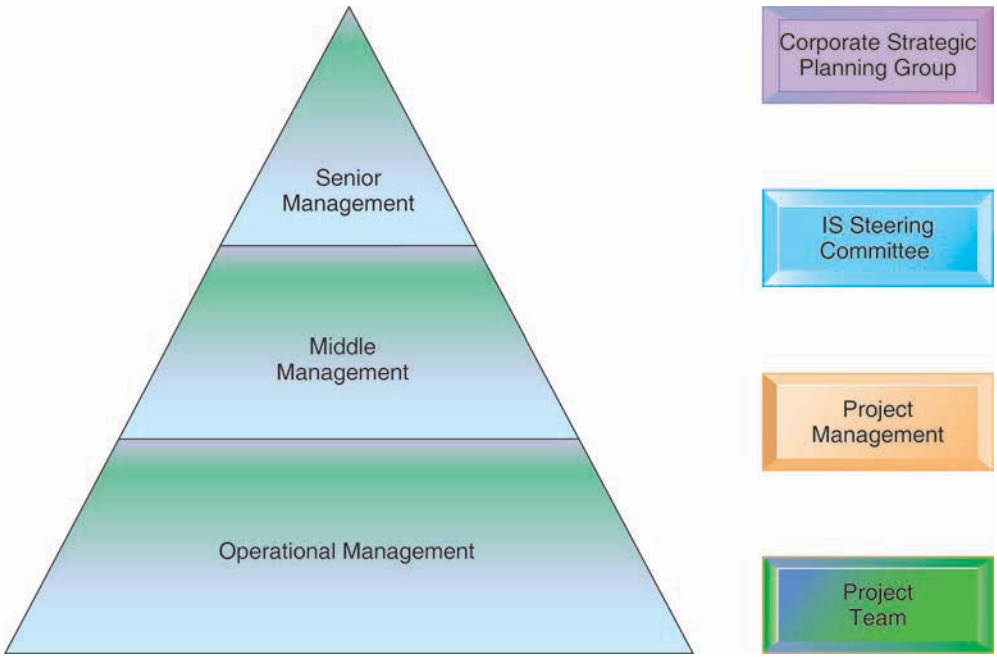
MANAGEMENT STRUCTURE FOR INFORMATION SYSTEMS PROJECTS

Figure 14.2 shows the elements of a management structure for information systems projects in a large corporation. It helps ensure that the most important projects are given priority.

At the apex of this structure is the corporate strategic planning group and the information system steering committee. The corporate strategic planning group is responsible for developing the firm's strategic plan, which may require the development of new systems. Often, this group will have developed objective measures of firm performance (called "key performance indicators," introduced in Chapter 12) and choose to support IT projects which can make a substantial improvement in one or several key performance indicators. These performance indicators are reviewed and discussed by the firm's board of directors.

The information systems steering committee is the senior management group with responsibility for systems development and operation. It is composed of department heads from both end-user and information systems areas. The steering committee reviews and approves plans for systems in all divisions, seeks to coordinate and integrate systems, and occasionally becomes involved in selecting specific information systems projects. This group also has a keen awareness of the key performance indicators decided on by higher level managers and the board of directors.

FIGURE 14.2 MANAGEMENT CONTROL OF SYSTEMS PROJECTS



Each level of management in the hierarchy is responsible for specific aspects of systems projects, and this structure helps give priority to the most important systems projects for the organization.

The project team is supervised by a project management group composed of information systems managers and end-user managers responsible for overseeing several specific information systems projects. The project team is directly responsible for the individual systems project. It consists of systems analysts, specialists from the relevant end-user business areas, application programmers, and perhaps database specialists. The mix of skills and the size of the project team depend on the specific nature of the system solution.

LINKING SYSTEMS PROJECTS TO THE BUSINESS PLAN

In order to identify the information systems projects that will deliver the most business value, organizations need to develop an **information systems plan** that supports their overall business plan and in which strategic systems are incorporated into top-level planning. The plan serves as a road map indicating the direction of systems development (the purpose of the plan), the rationale, the current systems/situation, new developments to consider, the management strategy, the implementation plan, and the budget (see Table 14.1).

The plan contains a statement of corporate goals and specifies how information technology will support the attainment of those goals. The report shows how general goals will be achieved by specific systems projects. It identifies specific target dates and milestones that can be used later to evaluate the plan's progress in terms of how many objectives were actually attained in the time frame specified in the plan. The plan indicates the key management decisions concerning hardware acquisition; telecommunications; centralization/decentralization of authority, data, and hardware; and required organizational change. Organizational changes are also usually described, including management

TABLE 14.1 INFORMATION SYSTEMS PLAN

1.	Purpose of the Plan Overview of plan contents Current business organization and future organization Key business processes Management strategy
2.	Strategic Business Plan Rationale Current situation Current business organization Changing environments Major goals of the business plan Firm's strategic plan
3.	Current Systems Major systems supporting business functions and processes Current infrastructure capabilities Hardware Software Database Telecommunications and Internet Difficulties meeting business requirements Anticipated future demands
4.	New Developments New system projects Project descriptions Business rationale Applications' role in strategy New infrastructure capabilities required Hardware Software Database Telecommunications and Internet
5.	Management Strategy Acquisition plans Milestones and timing Organizational realignment Internal reorganization Management controls Major training initiatives Personnel strategy
6.	Implementation Plan Anticipated difficulties in implementation Progress reports
7.	Budget Requirements Requirements Potential savings Financing Acquisition cycle

and employee training requirements, recruiting efforts, changes in business processes, and changes in authority, structure, or management practice.

In order to plan effectively, firms will need to inventory and document all of their information system applications and IT infrastructure components. For projects in which benefits involve improved decision making, managers should try to identify the decision improvements that would provide the greatest additional value to the firm. They should then develop a set of metrics to quantify the value of more timely and precise information on the outcome of the decision. (See Chapter 12 for more detail on this topic.)

INFORMATION REQUIREMENTS AND KEY PERFORMANCE INDICATORS

To develop an effective information systems plan, the organization must have a clear understanding of both its long- and short-term information requirements. A strategic approach to information requirements, strategic analysis, or critical success factors argues that an organization's information requirements are determined by a small number of **key performance indicators (KPIs)** of managers. KPIs are shaped by the industry, the firm, the manager, and the broader environment. For instance, KPIs for an automobile firm might be unit production costs, labor costs, factory productivity, re-work and error rate, customer brand recognition surveys, J.D. Power quality rankings, employee job satisfaction ratings, and health costs. New information systems should focus on providing information that helps the firm meet these goals implied by key performance indicators.

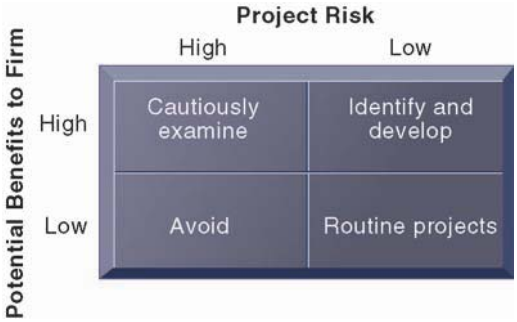
PORTFOLIO ANALYSIS

Once strategic analyses have determined the overall direction of systems development, **portfolio analysis** can be used to evaluate alternative system projects. Portfolio analysis inventories all of the organization's information systems projects and assets, including infrastructure, outsourcing contracts, and licenses. This portfolio of information systems investments can be described as having a certain profile of risk and benefit to the firm (see Figure 14.3) similar to a financial portfolio.

Each information systems project carries its own set of risks and benefits. (Section 14.4 describes the factors that increase the risks of systems projects.) Firms would try to improve the return on their portfolios of IT assets by balancing the risk and return from their systems investments. Although there is no ideal profile for all firms, information-intensive industries (e.g., finance) should have a few high-risk, high-benefit projects to ensure that they stay current with technology. Firms in non-information-intensive industries should focus on high-benefit, low-risk projects.

Most desirable, of course, are systems with high benefit and low risk. These promise early returns and low risks. Second, high-benefit, high-risk systems should be examined; low-benefit, high-risk systems should be totally avoided; and low-benefit, low-risk systems should be reexamined for the possibility of rebuilding and replacing them with more desirable systems having higher benefits. By using portfolio analysis, management can determine the optimal mix of investment risk and reward for their firms, balancing riskier high-reward projects with safer lower-reward ones. Firms where portfolio analysis is aligned with business strategy have been found to have a superior return on their IT

FIGURE 14.3 A SYSTEM PORTFOLIO



Companies should examine their portfolio of projects in terms of potential benefits and likely risks. Certain kinds of projects should be avoided altogether and others developed rapidly. There is no ideal mix. Companies in different industries have different profiles.

assets, better alignment of IT investments with business objectives, and better organization-wide coordination of IT investments (Jeffrey and Leliveld, 2004).

SCORING MODELS

A **scoring model** is useful for selecting projects where many criteria must be considered. It assigns weights to various features of a system and then calculates the weighted totals. Using Table 14.2, the firm must decide among two alternative enterprise resource planning (ERP) systems. The first column lists the criteria that decision makers will use to evaluate the systems. These criteria are usually the result of lengthy discussions among the decision-making group. Often the most important outcome of a scoring model is not the score but agreement on the criteria used to judge a system.

Table 14.2 shows that this particular company attaches the most importance to capabilities for sales order processing, inventory management, and warehousing. The second column in Table 14.2 lists the weights that decision makers attached to the decision criteria. Columns 3 and 5 show the percentage of requirements for each function that each alternative ERP system can provide. Each vendor's score can be calculated by multiplying the percentage of requirements met for each function by the weight attached to that function. ERP System B has the highest total score.

As with all "objective" techniques, there are many qualitative judgments involved in using the scoring model. This model requires experts who understand the issues and the technology. It is appropriate to cycle through the scoring model several times, changing the criteria and weights, to see how sensitive the outcome is to reasonable changes in criteria. Scoring models are used most commonly to confirm, to rationalize, and to support decisions, rather than as the final arbiters of system selection.

14.3 Establishing the Business Value of Information Systems

Even if a system project supports a firm's strategic goals and meets user information requirements, it needs to be a good investment for the firm. The

TABLE 14.2 EXAMPLE OF A SCORING MODEL FOR AN ERP SYSTEM

CRITERIA	WEIGHT	ERP SYSTEM A %	ERP SYSTEM A SCORE	ERP SYSTEM B %	ERP SYSTEM B SCORE
1.0 Order Processing					
1.1 Online order entry	4	67	268	73	292
1.2 Online pricing	4	81	324	87	348
1.3 Inventory check	4	72	288	81	324
1.4 Customer credit check	3	66	198	59	177
1.5 Invoicing	4	73	292	82	328
Total Order Processing			1,370		1,469
2.0 Inventory Management					
2.1 Production forecasting	3	72	216	76	228
2.2 Production planning	4	79	316	81	324
2.3 Inventory control	4	68	272	80	320
2.4 Reports	3	71	213	69	207
Total Inventory Management			1,017		1,079
3.0 Warehousing					
3.1 Receiving	2	71	142	75	150
3.2 Picking/packing	3	77	231	82	246
3.3 Shipping	4	92	368	89	356
Total Warehousing			741		752
Grand Total			3,128		3,300

value of systems from a financial perspective essentially revolves around the issue of return on invested capital. Does a particular information system investment produce sufficient returns to justify its costs?

INFORMATION SYSTEM COSTS AND BENEFITS

Table 14.3 lists some of the more common costs and benefits of systems. **Tangible benefits** can be quantified and assigned a monetary value. **Intangible benefits**, such as more efficient customer service or enhanced decision making, cannot be immediately quantified but may lead to quantifiable gains in the long run. Transaction and clerical systems that displace labor and save space always produce more measurable, tangible benefits than management information systems, decision-support systems, and computer-supported collaborative work systems (see Chapters 2 and 11).

Chapter 5 introduced the concept of total cost of ownership (TCO), which is designed to identify and measure the components of information technology expenditures beyond the initial cost of purchasing and installing hardware and software. However, TCO analysis provides only part of the information needed to evaluate an information technology investment because it does not

TABLE 14.3 COSTS AND BENEFITS OF INFORMATION SYSTEMS

COSTS
Hardware
Telecommunications
Software
Services
Personnel
TANGIBLE BENEFITS (COST SAVINGS)
Increased productivity
Lower operational costs
Reduced workforce
Lower computer expenses
Lower outside vendor costs
Lower clerical and professional costs
Reduced rate of growth in expenses
Reduced facility costs
INTANGIBLE BENEFITS
Improved asset utilization
Improved resource control
Improved organizational planning
Increased organizational flexibility
More timely information
More information
Increased organizational learning
Legal requirements attained
Enhanced employee goodwill
Increased job satisfaction
Improved decision making
Improved operations
Higher client satisfaction
Better corporate image

typically deal with benefits, cost categories such as complexity costs, and "soft" and strategic factors discussed later in this section.

Capital Budgeting for Information Systems

To determine the benefits of a particular project, you'll need to calculate all of its costs and all of its benefits. Obviously, a project where costs exceed benefits should be rejected. But even if the benefits outweigh the costs, additional financial analysis is required to determine whether the project represents a good return on the firm's invested capital. **Capital budgeting** models are one of several techniques used to measure the value of investing in long-term capital investment projects.

Capital budgeting methods rely on measures of cash flows into and out of the firm; capital projects generate those cash flows. The investment cost for information systems projects is an immediate cash outflow caused by expenditures for

hardware, software, and labor. In subsequent years, the investment may cause additional cash outflows that will be balanced by cash inflows resulting from the investment. Cash inflows take the form of increased sales of more products (for reasons such as new products, higher quality, or increasing market share) or reduced costs in production and operations. The difference between cash outflows and cash inflows is used for calculating the financial worth of an investment. Once the cash flows have been established, several alternative methods are available for comparing different projects and deciding about the investment.

The principal capital budgeting models for evaluating IT projects are: the payback method, the accounting rate of return on investment (ROI), net present value, and the internal rate of return (IRR). You can find out more about how these capital budgeting models are used to justify information system investments in the Learning Tracks for this chapter.

REAL OPTIONS PRICING MODELS

Some information systems projects are highly uncertain, especially investments in IT infrastructure. Their future revenue streams are unclear and their up-front costs are high. Suppose, for instance, that a firm is considering a $20 million investment to upgrade its IT infrastructure—its hardware, software, data management tools, and networking technology. If this upgraded infrastructure were available, the organization would have the technology capabilities to respond more easily to future problems and opportunities. Although the costs of this investment can be calculated, not all of the benefits of making this investment can be established in advance. But if the firm waits a few years until the revenue potential becomes more obvious, it might be too late to make the infrastructure investment. In such cases, managers might benefit from using real options pricing models to evaluate information technology investments.

Real options pricing models (ROPMs) use the concept of options valuation borrowed from the financial industry. An *option* is essentially the right, but not the obligation, to act at some future date. A typical *call option*, for instance, is a financial option in which a person buys the right (but not the obligation) to purchase an underlying asset (usually a stock) at a fixed price (strike price) on or before a given date.

For instance, let's assume that on April 25, 2012, you could purchase a call option for $17.09 that would give you the right to buy a share of Procter & Gamble (P&G) common stock for $50 per share on a certain date. Options expire over time, and this call option has an expiration date of January 17, 2014. If the price of P&G common stock does not rise above $50 per share by the stock market close on January 17, 2014, you would not exercise the option, and the value of the option would fall to zero on the strike date. If, however, the price of P&G stock rose to, say, $100 per share, you could purchase the stock for the strike price of $50 and retain the profit of $50 per share minus the cost on the option. (Because the option is sold as a 100-share contract, the cost of the contract would be 100 × $17.09 before commissions, or $1,709, and you would be purchasing and obtaining a profit from 100 shares of Procter & Gamble.) The stock option enables the owner to benefit from the upside potential of an opportunity while limiting the downside risk.

ROPMs value information systems projects similar to stock options, where an initial expenditure on technology creates the right, but not the obligation, to obtain the benefits associated with further development and deployment of the technology as long as management has the freedom to cancel, defer, restart, or expand the project. ROPMs give managers the flexibility to stage

their IT investment or test the waters with small pilot projects or prototypes to gain more knowledge about the risks of a project before investing in the entire implementation. The disadvantages of this model are primarily in estimating all the key variables affecting option value, including anticipated cash flows from the underlying asset and changes in the cost of implementation. Models for determining option value of information technology platforms are being developed (Fichman, 2004; McGrath and MacMillan, 2000).

LIMITATIONS OF FINANCIAL MODELS

The traditional focus on the financial and technical aspects of an information system tends to overlook the social and organizational dimensions of information systems that may affect the true costs and benefits of the investment. Many companies' information systems investment decisions do not adequately consider costs from organizational disruptions created by a new system, such as the cost to train end users, the impact that users' learning curves for a new system have on productivity, or the time managers need to spend overseeing new system-related changes. Benefits, such as more timely decisions from a new system or enhanced employee learning and expertise, may also be overlooked in a traditional financial analysis (Ryan, Harrison, and Schkade, 2002).

14.4 Managing Project Risk

We have already introduced the topic of information system risks and risk assessment in Chapter 8. In this chapter, we describe the specific risks to information systems projects and show what can be done to manage them effectively.

DIMENSIONS OF PROJECT RISK

Systems differ dramatically in their size, scope, level of complexity, and organizational and technical components. Some systems development projects are more likely to create the problems we have described earlier or to suffer delays because they carry a much higher level of risk than others. The level of project risk is influenced by project size, project structure, and the level of technical expertise of the information systems staff and project team.

- *Project size*. The larger the project—as indicated by the dollars spent, the size of the implementation staff, the time allocated for implementation, and the number of organizational units affected—the greater the risk. Very large-scale systems projects have a failure rate that is 50 to 75 percent higher than that for other projects because such projects are complex and difficult to control. The organizational complexity of the system—how many units and groups use it and how much it influences business processes—contribute to the complexity of large-scale systems projects just as much as technical characteristics, such as the number of lines of program code, length of project, and budget. In addition, there are few reliable techniques for estimating the time and cost to develop large-scale information systems.
- *Project structure*. Some projects are more highly structured than others. Their requirements are clear and straightforward so outputs and processes can be easily defined. Users know exactly what they want and what the system should do; there is almost no possibility of the users changing their minds.

Such projects run a much lower risk than those with relatively undefined, fluid, and constantly changing requirements; with outputs that cannot be fixed easily because they are subject to users' changing ideas; or with users who cannot agree on what they want.

- *Experience with technology*. The project risk rises if the project team and the information system staff lack the required technical expertise. If the team is unfamiliar with the hardware, system software, application software, or database management system proposed for the project, it is highly likely that the project will experience technical problems or take more time to complete because of the need to master new skills.

Although the difficulty of the technology is one risk factor in information systems projects, the other factors are primarily organizational, dealing with the complexity of information requirements, the scope of the project, and how many parts of the organization will be affected by a new information system.

CHANGE MANAGEMENT AND THE CONCEPT OF IMPLEMENTATION

The introduction or alteration of an information system has a powerful behavioral and organizational impact. Changes in the way that information is defined, accessed, and used to manage the organization's resources often lead to new distributions of authority and power. This internal organizational change breeds resistance and opposition and can lead to the demise of an otherwise good system.

A very large percentage of information systems projects stumble because the process of organizational change surrounding system building was not properly addressed. Successful system building requires careful **change management**.

The Concept of Implementation

To manage the organizational change surrounding the introduction of a new information system effectively, you must examine the process of implementation. **Implementation** refers to all organizational activities working toward the adoption, management, and routinization of an innovation, such as a new formation system. In the implementation process, the systems analyst is a **change agent**. The analyst not only develops technical solutions but also redefines the configurations, interactions, job activities, and power relationships of various organizational groups. The analyst is the catalyst for the entire change process and is responsible for ensuring that all parties involved accept the changes created by a new system. The change agent communicates with users, mediates between competing interest groups, and ensures that the organizational adjustment to such changes is complete.

The Role of End Users

System implementation generally benefits from high levels of user involvement and management support. User participation in the design and operation of information systems has several positive results. First, if users are heavily involved in systems design, they have more opportunities to mold the system according to their priorities and business requirements, and more opportunities to control the outcome. Second, they are more likely to react positively to the completed system because they have been active participants in the change process. Incorporating user knowledge and expertise leads to better solutions.

The relationship between users and information systems specialists has traditionally been a problem area for information systems implementation efforts. Users and information systems specialists tend to have different backgrounds, interests, and priorities. This is referred to as the **user-designer communications gap**. These differences lead to divergent organizational loyalties, approaches to problem solving, and vocabularies.

Information systems specialists, for example, often have a highly technical, or machine, orientation to problem solving. They look for elegant and sophisticated technical solutions in which hardware and software efficiency is optimized at the expense of ease of use or organizational effectiveness. Users prefer systems that are oriented toward solving business problems or facilitating organizational tasks. Often the orientations of both groups are so at odds that they appear to speak in different tongues.

These differences are illustrated in Table 14.4, which depicts the typical concerns of end users and technical specialists (information systems designers) regarding the development of a new information system. Communication problems between end users and designers are a major reason why user requirements are not properly incorporated into information systems and why users are driven out of the implementation process.

Systems development projects run a very high risk of failure when there is a pronounced gap between users and technical specialists and when these groups continue to pursue different goals. Under such conditions, users are often driven away from the project. Because they cannot comprehend what the technicians are saying, users conclude that the entire project is best left in the hands of the information specialists alone.

Management Support and Commitment

If an information systems project has the backing and commitment of management at various levels, it is more likely to be perceived positively by both users and the technical information services staff. Both groups will believe that their participation in the development process will receive higher-level attention and priority. They will be recognized and rewarded for the time and effort they devote to implementation. Management backing also ensures that a systems project receives sufficient funding and resources to be successful. Furthermore, to be enforced effectively, all the changes in work habits and procedures and any organizational realignments associated with a new system depend on management backing. If a manager considers a new system a priority, the system will more likely be treated that way by his or her subordinates.

TABLE 14.4 THE USER DESIGNER COMMUNICATIONS GAP

USER CONCERNS	DESIGNER CONCERNS
Will the system deliver the information we need for our work?	What demands will this system put on our servers?
Can we access the data on our iPhones, BlackBerrys, tablets, and PCs?	What kind of programming demands will this place on our group?
What new procedures do we need to enter data into the system?	Where will the data be stored? What's the most efficient way to store them?
How will the operation of the system change employees' daily routines?	What technologies should we use to secure the data?

Change Management Challenges for Business Process Reengineering, Enterprise Applications, and Mergers and Acquisitions

Given the challenges of innovation and implementation, it is not surprising to find a very high failure rate among enterprise application and business process reengineering (BPR) projects, which typically require extensive organizational change and which may require replacing old technologies and legacy systems that are deeply rooted in many interrelated business processes. A number of studies have indicated that 70 percent of all business process reengineering projects fail to deliver promised benefits. Likewise, a high percentage of enterprise applications fail to be fully implemented or to meet the goals of their users even after three years of work.

Many enterprise application and reengineering projects have been undermined by poor implementation and change management practices that failed to address employees' concerns about change. Dealing with fear and anxiety throughout the organization, overcoming resistance by key managers, and changing job functions, career paths, and recruitment practices have posed greater threats to reengineering than the difficulties companies faced visualizing and designing breakthrough changes to business processes. All of the enterprise applications require tighter coordination among different functional groups as well as extensive business process change (see Chapter 9).

Projects related to mergers and acquisitions have a similar failure rate. Mergers and acquisitions are deeply affected by the organizational characteristics of the merging companies as well as by their IT infrastructures. Combining the information systems of two different companies usually requires considerable organizational change and complex systems projects to manage. If the integration is not properly managed, firms can emerge with a tangled hodgepodge of inherited legacy systems built by aggregating the systems of one firm after another. Without a successful systems integration, the benefits anticipated from the merger cannot be realized, or, worse, the merged entity cannot execute its business processes effectively.

CONTROLLING RISK FACTORS

Various project management, requirements gathering, and planning methodologies have been developed for specific categories of implementation problems. Strategies have also been devised for ensuring that users play appropriate roles throughout the implementation period and for managing the organizational change process. Not all aspects of the implementation process can be easily controlled or planned. However, anticipating potential implementation problems and applying appropriate corrective strategies can increase the chances for system success.

The first step in managing project risk involves identifying the nature and level of risk confronting the project (Schmidt et al., 2001). Implementers can then handle each project with the tools and risk management approaches geared to its level of risk (Iversen, Mathiassen, and Nielsen, 2004; Barki, Rivard, and Talbot, 2001; McFarlan, 1981).

Managing Technical Complexity

Projects with challenging and complex technology for users to master benefit from **internal integration tools**. The success of such projects depends on how well their technical complexity can be managed. Project leaders need both heavy technical and administrative experience. They must be able to anticipate

problems and develop smooth working relationships among a predominantly technical team. The team should be under the leadership of a manager with a strong technical and project management background, and team members should be highly experienced. Team meetings should take place frequently. Essential technical skills or expertise not available internally should be secured from outside the organization.

Formal Planning and Control Tools

Large projects benefit from appropriate use of **formal planning tools** and **formal control tools** for documenting and monitoring project plans. The two most commonly used methods for documenting project plans are Gantt charts and PERT charts. A **Gantt chart** lists project activities and their corresponding start and completion dates. The Gantt chart visually represents the timing and duration of different tasks in a development project as well as their human resource requirements (see Figure 14.4). It shows each task as a horizontal bar whose length is proportional to the time required to complete it.

Although Gantt charts show when project activities begin and end, they don't depict task dependencies, how one task is affected if another is behind schedule, or how tasks should be ordered. That is where **PERT charts** are useful. PERT stands for Program Evaluation and Review Technique, a methodology developed by the U.S. Navy during the 1950s to manage the Polaris submarine missile program. A PERT chart graphically depicts project tasks and their interrelationships. The PERT chart lists the specific activities that make up a project and the activities that must be completed before a specific activity can start, as illustrated in Figure 14.5.

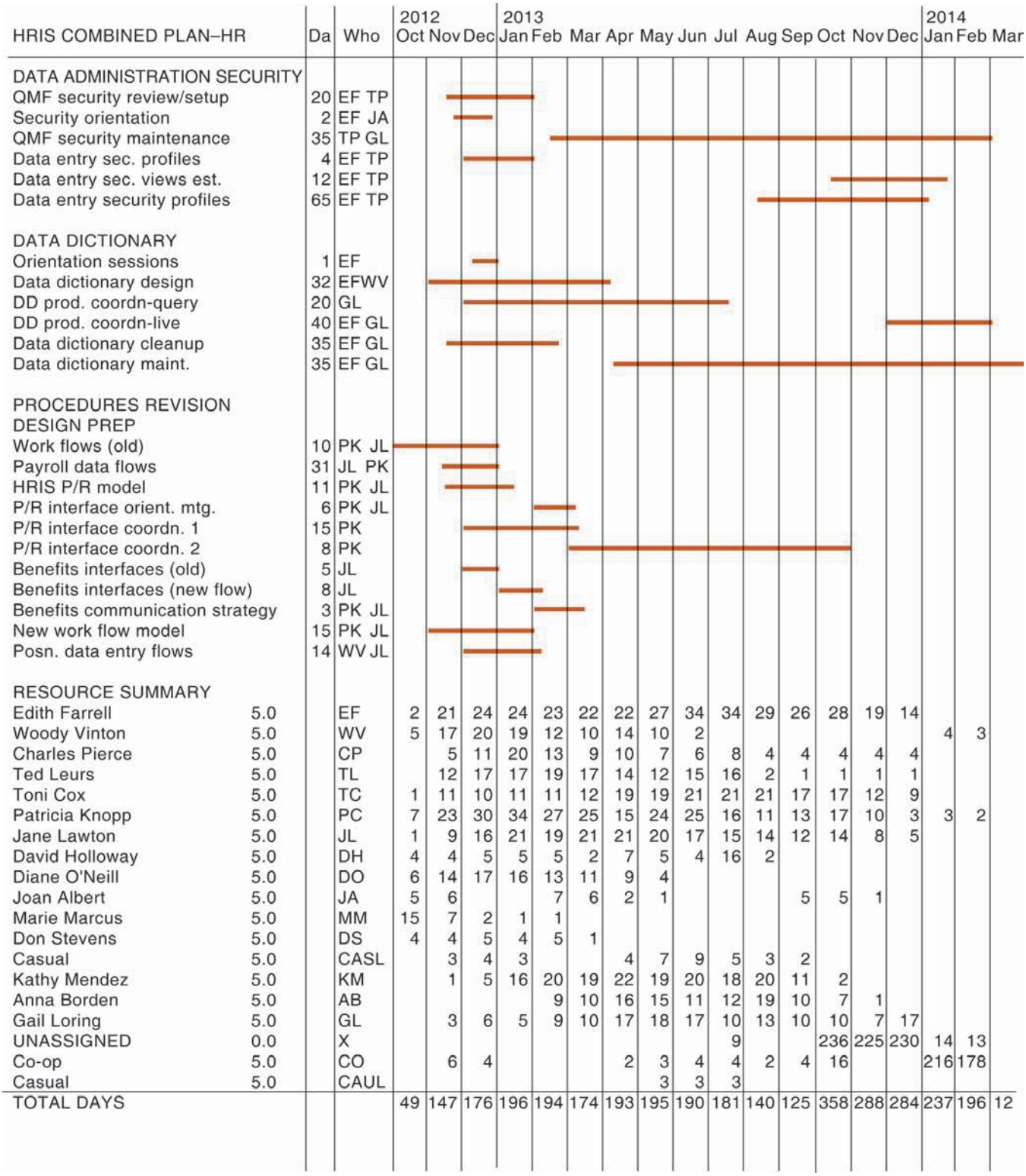
The PERT chart portrays a project as a network diagram consisting of numbered nodes (either circles or rectangles) representing project tasks. Each node is numbered and shows the task, its duration, the starting date, and the completion date. The direction of the arrows on the lines indicates the sequence of tasks and shows which activities must be completed before the commencement of another activity. In Figure 14.5, the tasks in nodes 2, 3, and 4 are not dependent on each other and can be undertaken simultaneously, but each is dependent on completion of the first task. PERT charts for complex projects can be difficult to interpret, and project managers often use both techniques.

These project management techniques can help managers identify bottlenecks and determine the impact that problems will have on project completion times. They can also help systems developers partition projects into smaller, more manageable segments with defined, measurable business results. Standard control techniques can successfully chart the progress of the project against budgets and target dates, so deviations from the plan can be spotted.

Increasing User Involvement and Overcoming User Resistance

Projects with relatively little structure and many undefined requirements must involve users fully at all stages. Users must be mobilized to support one of many possible design options and to remain committed to a single design. **External integration tools** consist of ways to link the work of the implementation team to users at all organizational levels. For instance, users can become active members of the project team, take on leadership roles, and take charge of installation and training. The implementation team can demonstrate its responsiveness to users, promptly answering questions, incorporating user feedback, and showing their willingness to help.

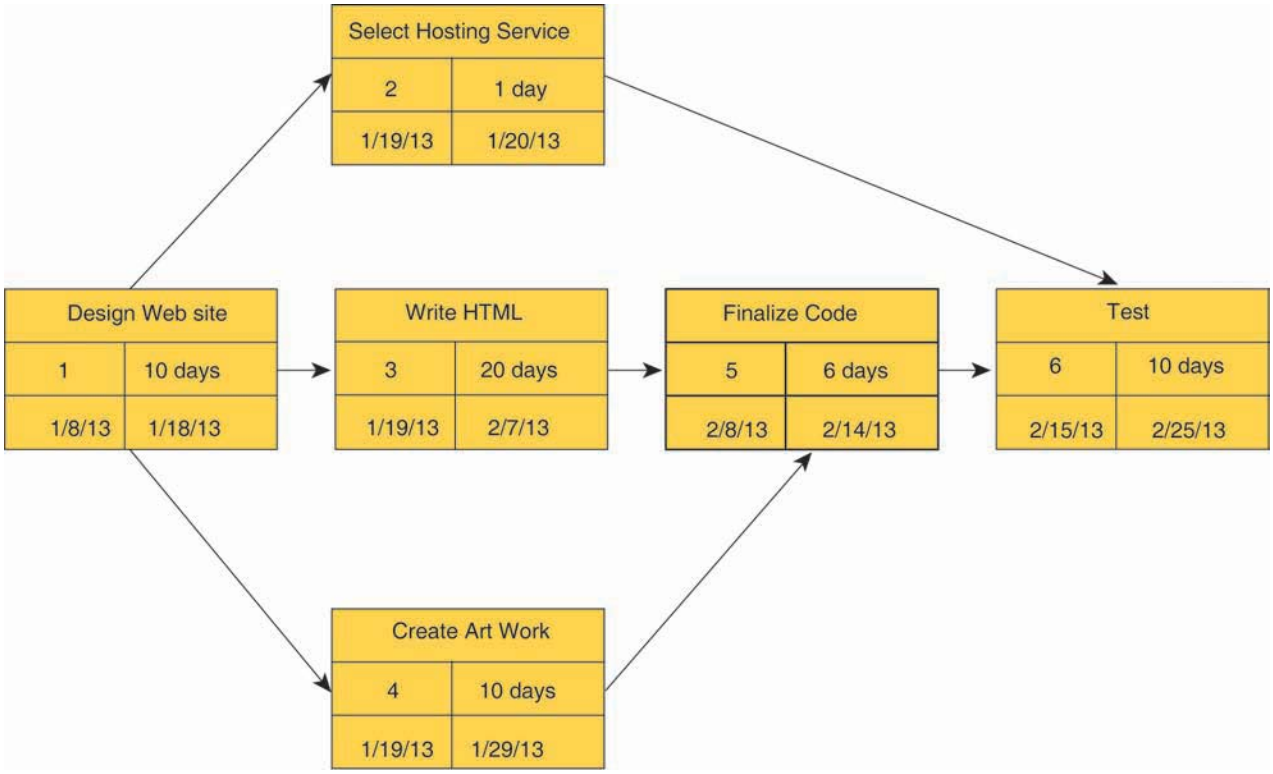
FIGURE 14.4 A GANTT CHART



HRIS COMBINED PLAN–HR	Da	Who	2012 Oct	Nov	Dec	2013 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	2014 Jan	Feb	Mar
DATA ADMINISTRATION SECURITY																				
QMF security review/setup	20	EF TP																		
Security orientation	2	EF JA																		
QMF security maintenance	35	TP GL																		
Data entry sec. profiles	4	EF TP																		
Data entry sec. views est.	12	EF TP																		
Data entry security profiles	65	EF TP																		
DATA DICTIONARY																				
Orientation sessions	1	EF																		
Data dictionary design	32	EFWV																		
DD prod. coordn-query	20	GL																		
DD prod. coordn-live	40	EF GL																		
Data dictionary cleanup	35	EF GL																		
Data dictionary maint.	35	EF GL																		
PROCEDURES REVISION DESIGN PREP																				
Work flows (old)	10	PK JL																		
Payroll data flows	31	JL PK																		
HRIS P/R model	11	PK JL																		
P/R interface orient. mtg.	6	PK JL																		
P/R interface coordn. 1	15	PK																		
P/R interface coordn. 2	8	PK																		
Benefits interfaces (old)	5	JL																		
Benefits interfaces (new flow)	8	JL																		
Benefits communication strategy	3	PK JL																		
New work flow model	15	PK JL																		
Posn. data entry flows	14	WV JL																		
RESOURCE SUMMARY																				
Edith Farrell	5.0	EF	2	21	24	24	23	22	22	27	34	34	29	26	28	19	14			
Woody Vinton	5.0	WV	5	17	20	19	12	10	14	10	2							4	3	
Charles Pierce	5.0	CP		5	11	20	13	9	10	7	6	8	4	4	4	4	4			
Ted Leurs	5.0	TL		12	17	17	19	17	14	12	15	16	2	1	1	1	1			
Toni Cox	5.0	TC	1	11	10	11	11	12	19	19	21	21	21	17	17	12	9			
Patricia Knopp	5.0	PC	7	23	30	34	27	25	15	24	25	16	11	13	17	10	3	3	2	
Jane Lawton	5.0	JL	1	9	16	21	19	21	21	20	17	15	14	12	14	8	5			
David Holloway	5.0	DH	4	4	5	5	5	2	7	5	4	16	2							
Diane O'Neill	5.0	DO	6	14	17	16	13	11	9	4										
Joan Albert	5.0	JA	5	6			7	6	2	1				5	5	1				
Marie Marcus	5.0	MM	15	7	2	1	1													
Don Stevens	5.0	DS	4	4	5	4	5	1												
Casual	5.0	CASL		3	4	3			4	7	9	5	3	2						
Kathy Mendez	5.0	KM		1	5	16	20	19	22	19	20	18	20	11	2					
Anna Borden	5.0	AB					9	10	16	15	11	12	19	10	7	1				
Gail Loring	5.0	GL		3	6	5	9	10	17	18	17	10	13	10	10	7	17			
UNASSIGNED	0.0	X										9			236	225	230	14	13	
Co-op	5.0	CO		6	4				2	3	4	4	2	4	16			216	178	
Casual	5.0	CAUL								3	3	3								
TOTAL DAYS			49	147	176	196	194	174	193	195	190	181	140	125	358	288	284	237	196	12

The Gantt chart in this figure shows the task, person-days, and initials of each responsible person, as well as the start and finish dates for each task. The resource summary provides a good manager with the total person-days for each month and for each person working on the project to manage the project successfully. The project described here is a data administration project.

FIGURE 14.5 A PERT CHART



This is a simplified PERT chart for creating a small Web site. It shows the ordering of project tasks and the relationship of a task with preceding and succeeding tasks.

Participation in implementation activities may not be enough to overcome the problem of user resistance to organizational change. Different users may be affected by the system in different ways. Whereas some users may welcome a new system because it brings changes they perceive as beneficial to them, others may resist these changes because they believe the shifts are detrimental to their interests.

If the use of a system is voluntary, users may choose to avoid it; if use is mandatory, resistance will take the form of increased error rates, disruptions, turnover, and even sabotage. Therefore, the implementation strategy must not only encourage user participation and involvement, but it must also address the issue of counterimplementation (Keen, 1981). **Counterimplementation** is a deliberate strategy to thwart the implementation of an information system or an innovation in an organization.

Strategies to overcome user resistance include user participation (to elicit commitment as well as to improve design), user education and training, management edicts and policies, and better incentives for users who cooperate. The new system can be made more user friendly by improving the end-user interface. Users will be more cooperative if organizational problems are solved prior to introducing the new system.

The Interactive Session on Organizations illustrates some of these issues at work. Westinghouse Electric Company launched a sweeping systems modernization program that included re-implementation of its enterprise applications. As you read this case, try to determine how Westinghouse addressed the risks and challenges of this project.

INTERACTIVE SESSION: ORGANIZATIONS

WESTINGHOUSE ELECTRIC TAKES ON THE RISKS OF A "BIG BANG" PROJECT

Westinghouse Electric Company provides fuel, services, technology, plant design, and equipment to utility and industrial customers in the worldwide commercial nuclear electric power industry. A private company created in 1999 after its predecessor was sold and spun off, Westinghouse has 14,500 employees in 17 countries and is headquartered in Cranberry Township, Pennsylvania. Shortly after Westinghouse's creation, the company implemented a full suite of SAP software across the enterprise.

For the past 15 years, the nuclear energy industry was in a holding pattern, with steady business throughout but minimal growth. Westinghouse supplied nuclear equipment and services to plants all around the world, and the business was successful. The initial SAP installation served Westinghouse just fine for nearly an entire decade. From 2010 onward, the nuclear energy industry started to expand. Westinghouse began to experience growth in sales, and its legacy SAP installation was not equipped to handle the increased volume of business.

Westinghouse needed to update its older system to support new processes, configurations, and functionalities that related to the larger amount of business it was conducting. The company estimated that it would increase in size fourfold over the next few years. Westinghouse opted to launch a sweeping new program to update its IT. The program, called Synergy internally, consisted of 40 different projects, and updating the SAP system was one of the largest.

Rather than simply upgrade its existing systems, Westinghouse opted to "re-implement" those systems with much more current SAP technology. Westinghouse did this because its 10-year-old SAP ERP implementation was too outdated. It was easier for the company to simply replace the old SAP ERP systems with a completely new configuration. The division of the Synergy project dedicated to the SAP re-implementation was known as Cornerstone, aptly named because the new system would be the foundation for the company's future growth.

Westinghouse wanted to start with a clean-core SAP environment with a completely new reconfiguration. The company's goals were to convert all existing data that the company wanted to save, as well as add new functionalities that would help the company manage its imminent growth. Westinghouse hoped to add a new general ledger, a new enterprise reporting environment based on SAP NetWeaver Business Warehouse (BW) and SAP BusinessObjects solutions, and new implementations of SAP Customer Relationship Management (CRM).

In order to ensure that the re-implementation went smoothly, Westinghouse took many precautions to manage the risks involved in such a significant change. First, the company ensured that every element of the Cornerstone project was motivated by a particular business driver or goal. For example, the SAP CRM implementation was intended to address the company's goal of aligning three distinct operational regions to present a single face in every customer location, and the SAP ERP Human Capital Management and SAP NetWeaver Portal implementation were intended to support the company's plan to increase global hiring. By associating goals with each element of the project, Westinghouse was able to more precisely control the implementation of the new system.

Once the elements of the new SAP system came into place, Westinghouse had to decide how to actually roll out the new system. It could have used a gradual, phased approach, adding new systems over a three-year period, but the company instead decided on what it called a "big-bang approach." Management decided that the company was growing too fast for a slow approach—it needed the new systems as soon as possible, and hoped to recoup the return on investment sooner rather than later. However, while the phased approach was more expensive, it was also much less risky. To manage the increased risk of the big-bang approach, the company brought in a change management consultant.

The consultant, John Flynn, helped Westinghouse with both the Synergy and Cornerstone projects, but focused on the Cornerstone project. Flynn performed a risk assessment study to identify business areas that were most likely to undergo significant change. He found that the Westinghouse supply chain was one of the areas most likely to endure significant

change, since the company's growth would add many new elements to the chain. Therefore, the change management team spent extra time with Westinghouse's supply chain staff members to help them understand the new project and its impact on their day-to-day routines. The project team recruited power users from the supply chain organization and discussed specific project details with business unit leaders. These meetings also helped gain support from supply chain executives who could better understand the link between the information systems project and their business goals, and then articulate this connection to other users.

Next, after mapping the risk associated with each element of the SAP re-implementation, Westinghouse had to finally switch, or cut over, to the new system. To handle that event, Flynn worked with business leaders to recruit coordinators for every site in the organization. Each site coordinator had a list of responsibilities and a checklist to complete prior to the system going live to ensure each site was ready when the switch was flipped. Westinghouse dedicated extra staff to answer employee questions in the problem areas designated by Flynn. The company created an automatic call distribution system and e-mail system that routed users across all time zones to the employees most able to answer their questions. For example, Westinghouse expected that there would be many questions about passwords, access issues, time entry, and purchase requisition management after the new system went live, so the company provided extra staff to answer those and other frequently asked questions. This "temporary help desk" handled over 2,000 inquiries during the first three weeks of the implementation. The project team also set up a blog where users could share tips and solutions.

The cutover to the new SAP system went smoothly, and the company plans to use many of the techniques that it learned from the implementation in the future. It plans to use the blog as its primary communication method for support solutions and other Synergy projects, and future additions to the SAP suite will be much easier than the sweeping big-bang change.

Sources: David Hannon, "Westinghouse Electric Company Sees Global Standard Processes as the Foundation for Future Business Success," SAP InsiderPROFILES, January–March 2012 and www.westinghousenuclear.com, accessed April 23, 2012.

CASE STUDY QUESTIONS

1. Identify and discuss the risks in Westinghouse Electric's Cornerstone project.
2. Why was change management so important for this project and this company?
3. What management, organization, and technology issues had to be addressed by the Westinghouse project team?
4. Should other companies use a "big-bang" implementation strategy? Why or why not? Explain your answer.

DESIGNING FOR THE ORGANIZATION

Because the purpose of a new system is to improve the organization's performance, information systems projects must explicitly address the ways in which the organization will change when the new system is installed, including installation of intranets, extranets, and Web applications. In addition to procedural changes, transformations in job functions, organizational structure, power relationships, and the work environment should be carefully planned.

Areas where users interface with the system require special attention, with sensitivity to ergonomics issues. **Ergonomics** refers to the interaction of people and machines in the work environment. It considers the design of jobs, health issues, and the end-user interface of information systems. Table 14.5

TABLE 14.5 ORGANIZATIONAL FACTORS IN SYSTEMS PLANNING AND IMPLEMENTATION

Employee participation and involvement
Job design
Standards and performance monitoring
Ergonomics (including equipment, user interfaces, and the work environment)
Employee grievance resolution procedures
Health and safety
Government regulatory compliance

lists the organizational dimensions that must be addressed when planning and implementing information systems.

Although systems analysis and design activities are supposed to include an organizational impact analysis, this area has traditionally been neglected. An **organizational impact analysis** explains how a proposed system will affect organizational structure, attitudes, decision making, and operations. To integrate information systems successfully with the organization, thorough and fully documented organizational impact assessments must be given more attention in the development effort.

Sociotechnical Design

One way of addressing human and organizational issues is to incorporate **sociotechnical design** practices into information systems projects. Designers set forth separate sets of technical and social design solutions. The social design plans explore different workgroup structures, allocation of tasks, and the design of individual jobs. The proposed technical solutions are compared with the proposed social solutions. The solution that best meets both social and technical objectives is selected for the final design. The resulting sociotechnical design is expected to produce an information system that blends technical efficiency with sensitivity to organizational and human needs, leading to higher job satisfaction and productivity.

PROJECT MANAGEMENT SOFTWARE TOOLS

Commercial software tools that automate many aspects of project management facilitate the project management process. Project management software typically features capabilities for defining and ordering tasks, assigning resources to tasks, establishing starting and ending dates to tasks, tracking progress, and facilitating modifications to tasks and resources. Many automate the creation of Gantt and PERT charts.

Some of these tools are large sophisticated programs for managing very large projects, dispersed work groups, and enterprise functions. These high-end tools can manage very large numbers of tasks and activities and complex relationships.

Microsoft Office Project 2010 has become the most widely used project management software today. It is PC-based, with capabilities for producing PERT and Gantt charts and for supporting critical path analysis, resource allocation, project tracking, and status reporting. Project also tracks the way changes

in one aspect of a project affect others. Project Professional 2010 provides collaborative project management capabilities when used with Microsoft Office Project Server 2010. Project Server stores project data in a central SQL Server database, enabling authorized users to access and update the data over the Internet. Project Server 2010 is tightly integrated with the Microsoft Windows SharePoint Services collaborative workspace platform. These features help large enterprises manage projects in many different locations. Products such as Easy Projects .NET and Vertabase are also useful for firms that want Web-based project management tools.

Going forward, delivery of project management software as a software service (SaaS) will make this technology accessible to more organizations, especially smaller ones. Open source versions of project management software such as Open Workbench and OpenProj will further reduce the total cost of ownership and attract new users. Thanks to the popularity of social media such as Facebook and Twitter, project management software is also likely to become more flexible, collaborative, and user-friendly.

While project management software helps organizations track individual projects, the resources allocated to them, and their costs, **project portfolio management software** helps organizations manage portfolios of projects and dependencies among them. Project portfolio management software helps managers compare proposals and projects against budgets and resource capacity levels to determine the optimal mix and sequencing of projects that best achieves the organization's strategic goals.

Learning Track Modules

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

1. Capital Budgeting Methods for Information System Investments
2. Information Technology Investments and Productivity
3. Enterprise Analysis (Business Systems Planning) and Critical Success Factors

Review Summary

1. *What are the objectives of project management and why is it so essential in developing information systems?*

   Good project management is essential for ensuring that systems are delivered on time, on budget, and provide genuine business benefits. Project management activities include planning the work, assessing the risk, estimating and acquiring resources required to accomplish the work, organizing the work, directing execution, and analyzing the results. Project management must deal with five major variables: scope, time, cost, quality, and risk.

2. *What methods can be used for selecting and evaluating information systems projects and aligning them with the firm's business goals?*

   Organizations need an information systems plan that describes how information technology supports the attainment of their business goals and documents all their system applications and IT infrastructure components. Large corporations will have a management structure to ensure the most important systems projects receive priority. Key performance indicators, portfolio analysis, and scoring models can be used to identify and evaluate alternative information systems projects.

3. *How can firms assess the business value of information systems projects?*

   To determine whether an information systems project is a good investment, one must calculate its costs and benefits. Tangible benefits are quantifiable, and intangible benefits that cannot be immediately quantified may provide quantifiable benefits in the future. Benefits that exceed costs should be analyzed using capital budgeting methods to make sure a project represents a good return on the firm's invested capital. Real options pricing models, which apply the same techniques for valuing financial options to systems investments, can be useful when considering highly uncertain IT investments.

4. *What are the principal risk factors in information systems projects?*

   The level of risk in a systems development project is determined by (1) project size, (2) project structure, and (3) experience with technology. IS projects are more likely to fail when there is insufficient or improper user participation in the systems development process, lack of management support, and poor management of the implementation process. There is a very high failure rate among projects involving business process reengineering, enterprise applications, and mergers and acquisitions because they require extensive organizational change.

5. *What strategies are useful for managing project risk and system implementation?*

   Implementation refers to the entire process of organizational change surrounding the introduction of a new information system. User support and involvement and management support and control of the implementation process are essential, as are mechanisms for dealing with the level of risk in each new systems project. Project risk factors can be brought under some control by a contingency approach to project management. The risk level of each project determines the appropriate mix of external integration tools, internal integration tools, formal planning tools, and formal control tools to be applied.

Key Terms

Capital budgeting, 569
Change agent, 572
Change management, 572
Counterimplementation, 577
Ergonomics, 579
External integration tools, 575
Formal control tools, 575
Formal planning tools, 575
Gantt chart, 575
Implementation, 572
Information systems plan, 564
Intangible benefits, 568
Internal integration tools, 574
Organizational impact analysis, 580
PERT chart, 575
Portfolio analysis, 566
Project, 560
Project management, 560
Project portfolio management, 581
Real options pricing models (ROPMs), 570
Scope, 562
Scoring model, 567
Sociotechnical design, 580
Tangible benefits, 568
User-designer communications gap, 573
User interface, 560

Review Questions

1. What are the objectives of project management and why is it so essential in developing information systems?
   - Describe information system problems resulting from poor project management.
   - Define project management. List and describe the project management activities and variables addressed by project management.
2. What methods can be used for selecting and evaluating information systems projects and aligning them with the firm's business goals?
   - Name and describe the groups responsible for the management of information systems projects.
   - Describe the purpose of an information systems plan and list the major categories in the plan.
   - Explain how key performance indicators, portfolio analysis, and scoring models can be used to select information systems projects.
3. How can firms assess the business value of information systems projects?
   - List and describe the major costs and benefits of information systems.
   - Distinguish between tangible and intangible benefits.
   - Explain how real options pricing models can help manages evaluate information technology investments.
4. What are the principal risk factors in information systems projects?
   - Identify and describe each of the principal risk factors in information systems projects.
   - Explain why builders of new information systems need to address implementation and change management.
   - Explain why eliciting support of management and end users is so essential for successful implementation of information systems projects.
   - Explain why there is such a high failure rate for implementations involving enterprise applications, business process reengineering, and mergers and acquisitions.
5. What strategies are useful for managing project risk and system implementation?
   - Identify and describe the strategies for controlling project risk.
   - Identify the organizational considerations that should be addressed by project planning and implementation.
   - Explain how project management software tools contribute to successful project management.

Discussion Questions

1. How much does project management impact the success of a new information system?
2. It has been said that most systems fail because systems builders ignore organizational behavior problems. Why might this be so?
3. What is the role of end users in information systems project management?

Hands-On MIS Projects

The projects in this section give you hands-on experience evaluating information systems projects, using spreadsheet software to perform capital budgeting analyses for new information systems investments, and using Web tools to analyze the financing for a new home.

Management Decision Problems

1. The U.S. Census launched an IT project to arm its census takers in the field with high-tech handheld devices that would save taxpayer money by directly beaming population data to headquarters from census takers in the field. Census officials signed a $600 million contract with Harris Corporation in 2006 to build

500,000 devices, but still weren't sure which features they wanted included in the units. Census officials did not specify the testing process to measure the performance of the handheld devices. As the project progressed, 400 change requests to project requirements were added. Two years and hundreds of millions of taxpayer dollars later, the handhelds were far too slow and unreliable to be used for the 2010 U.S. census. What could Census Bureau management and the Harris Corporation have done to prevent this outcome?

2. Caterpillar is the world's leading maker of earth-moving machinery and supplier of agricultural equipment. Caterpillar wants to end its support for its Dealer Business System (DBS), which it licenses to its dealers to help them run their businesses. The software in this system is becoming outdated, and senior management wants to transfer support for the hosted version of the software to Accenture Consultants so it can concentrate on its core business. Caterpillar never required its dealers to use DBS, but the system had become a de facto standard for doing business with the company. The majority of the 50 Cat dealers in North America use some version of DBS, as do about half of the 200 or so Cat dealers in the rest of the world. Before Caterpillar turns the product over to Accenture, what factors and issues should it consider? What questions should it ask? What questions should its dealers ask?

Improving Decision Making: Using Spreadsheet Software for Capital Budgeting for a New CAD System

Software skills: Spreadsheet formulas and functions
Business skills: Capital budgeting

This project provides you with an opportunity to use spreadsheet software to use the capital budgeting models discussed in this chapter to analyze the return on an investment for a new computer-aided design (CAD) system.

Your company would like to invest in a new computer-aided design (CAD) system that requires purchasing hardware, software, and networking technology, as well as expenditures for installation, training, and support. MyMISLab contains tables showing each cost component for the new system as well as annual maintenance costs over a five-year period, along with a Learning Track on capital budgeting models. You believe the new system will reduce the amount of labor required to generate designs and design specifications, thereby increasing your firm's annual cash flow.

- Using the data provided in these tables, create a worksheet that calculates the costs and benefits of the investment over a five-year period and analyzes the investment using the four capital budgeting models presented in this chapter's Learning Track.
- Is this investment worthwhile? Why or why not?

Improving Decision Making: Using Web Tools for Buying and Financing a Home

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

This project will develop your skills using Web-based software for searching for a home and calculating mortgage financing for that home.

You would like to purchase a home in Fort Collins, Colorado. Ideally, it should be a single-family house with at least three bedrooms and one bathroom that costs between $150,000 and $225,000 and finance it with a 30-year fixed rate mortgage. You can afford a down payment that is 20 percent of the value of the house. Before you purchase a house, you would like to find out what homes are available in your price range, find a mortgage, and determine the amount of your monthly payment. Use the Yahoo! Homes site to help you with the following tasks:

- Locate homes in Fort Collins, Colorado, that meet your specifications.
- Find a mortgage for 80 percent of the list price of the home. Compare rates from at least three sites (use search engines to find sites other than Yahoo).
- After selecting a mortgage, calculate your closing costs and the monthly payment.

When you are finished, evaluate the whole process. For example, assess the ease of use of the site and your ability to find information about houses and mortgages, the accuracy of the information you found, and the breadth of choice of homes and mortgages.

Video Cases

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

Collaboration and Teamwork Project

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

NYCAPS and CityTime: A Tale of Two New York City IS Projects

CASE STUDY

New York City Mayor Michael Bloomberg made his fortune in information technology, as the owner of Bloomberg L.P., a giant financial news and information services media company. Bloomberg thought he could translate his success in modernizing information technology on Wall Street to modernizing New York City's government, and he launched a series of projects to do just that. Two of those projects proved him dead wrong.

Both the New York City Automated Personnel System (NYCAPS) and the CityTime system for payroll-related employee timekeeping have been fraught with cost overruns, mismanagement, and an overall failure to deliver an information system that has the capabilities sought by New York City government. How could this happen?

Soon after becoming mayor, Bloomberg announced the development of NYCAPS. The NYCAPS project had a budget of $66 million at its outset. The goal of the project was to create a modern, automated system for managing and updating personnel information for New York City's workforce, including employee benefit information. Personnel management was a prime target for a sweeping technological overhaul, since the city was using eight individual citywide systems, 200 systems within individual agencies, and a maze of paperwork for handling employee benefits and job changes. A timely and successful implementation of the NYCAPS project stood to save the city millions of dollars per year in labor and IT costs. To date, the implementation has been anything but timely, and the total expenditures of the project have grown to over $363 million, nearly six times the original budget.

Project monitors from within the administration filed reports that described the chronic mismanagement, cost overruns, and general waste plaguing the project, but the city continued ahead with the project without making any significant changes. One report from as far back as 2003 detailed that "no sense of economy, efficiency, or value is evident in any area of the project." These reports indicated that the primary reason for the project's ballooning costs and myriad delays was lack of strong leadership.

The NYCAPS project was controlled by government officials who did not have the authority or expertise to make important project decisions, and therefore missed many opportunities to lower development costs. Early on, in 2002, NYCAPS's lone functionality was as a Web site where people could apply to take civil service exams. But less than two weeks after the launch of the site, a user found that he could obtain other users' personal information by exploiting a security flaw, and the site was immediately shut down. Officials in charge of the project then vowed to fix the flaw and get the project right.

However, instead of taking charge of more facets of the project, the Bloomberg administration delegated more of the project to Accenture, a prominent consulting firm. Bloomberg has tended to favor outside expertise for improving the workings of government, especially for information technology projects. The city tasked Accenture with both defining the specifications of the system as well as putting it together themselves. Companies and government agencies building a new system rarely do this, since splitting those roles keeps the costs from any one contractor from exploding unchecked.

This is just what happened with Accenture. Accenture consultants charged the city up to $400 an hour, and the company earned $8 million from the city in 2004, then $26 million in 2005, $29 million in 2006, and a whopping $53 million in 2007. Raj Agarwal, the city's appointed project manager, was outspoken in his criticisms of Accenture's billing techniques, claiming that they were billing at rates that reflected many more consultants than were actually on the job, and that the company was using recent college graduates and interns to perform the work, all while billing the city at much higher rates typically used for experienced workers. Agarwal has long since quit his post, and the city has struggled to attract experienced and capable managers from the private sector. The city was eventually able to switch Accenture to fixed-price billing.

Accenture has put the blame on the city for increasing the scope and functionality of the project beyond the original specifications while it was being developed. As time passed and the city grew desperate for a functioning version of the system, the city abandoned development on many of the capabilities that the system was intended to have. Nearly 10 years after the project was launched, the city has a live version of NYCAPS, but thousands of retirees still cannot access the site and thousands more

current workers are not included in the system. Even worse, NYCAPS was built to run on the same old legacy systems that used the previous patchwork system, despite the fact that upgrading legacy technology was a major reason for the project's development in the first place.

As bad as the NYCAPS project has become, an earlier, even more ambitious New York City project makes it look tame by comparison. The CityTime payroll system project, first conceived in 1998, has seen its budget grow from approximately $65 million to well over $700 million as of 2012. CityTime was created to automate payroll timekeeping once dependent on pen and paper, and in the process to curb undeserved overtime payments to city workers and improve accountability throughout the government. In an ironic twist, the project has instead been permeated with fraud at every level, and engineers from the main consulting organization, Science Applications International Corporation (SAIC) were charged with fraud.

A June 2011 press release from Manhattan U.S. Attorney Preet Bharara states that "the alleged criminal scheme extended across virtually every level of (CityTime); contractors and subcontractors systematically inflated costs, overbilled for consultants' time, and artificially extended the completion date." Again, the biggest reason for the project's unheard-of budget increases is lack of qualified oversight. The few government employees constantly monitoring the project turned a seemingly blind eye on the ballooning costs incurred by SAIC and the lack of progress in the project. Belief that the software developed for the system could be sold to other governments was perhaps another reason why the city let costs balloon.

Bloomberg's budget director, Mark Page, was reportedly the strongest voice in favor of CityTime. He had hoped to stop the trend of police officers, firefighters, and other aging city workers receiving unnecessary overtime at the end of their careers, presumably to increase their pensions. Page also wanted to limit lawsuits against the city from workers claiming their pay was too low for the hours they had worked. But Page's background was in law, not information systems, making him a poor choice to oversee CityTime. Other government branches, like the city comptroller, left the project mostly to Page. William C. Thompson, the city comptroller from 2002 to 2009, never audited CityTime despite numerous warnings about the project from staffers. Still, an aide for the mayor did suggest that the comptroller's office had raised concerns about the project to the mayor, but those concerns too were ignored or dismissed by Page.

The lack of adequate government oversight of the CityTime project may have been the biggest reason for the hundreds of millions of dollars in cost overruns incurred since the project's conception in 1998, but the main beneficiary of those overruns has been SAIC. In 2000, work on the project was transferred to SAIC from the first contractor, a subsidiary of MCI. Instead of the usual competitive bidding process for contracts, the city opted simply to pass it off to SAIC, a transfer which is still being reviewed by city investigators. Shortly after SAIC took control of the contract, work on CityTime was switched from fixed-price to hourly billing. This, in turn, inflated costs from $224 million in 2006 to a total of $628 million by 2009. Thanks to the hourly contracts, the city was on the hook for all of the waste incurred by SAIC. The terms of contracts were also constantly changing: another consulting company hired to provide quality assurance for CityTime had its contract amended 11 times, increasing its value to almost $50 million from its original $3.4 million figure.

SAIC delegated most of the work on CityTime to subcontractors, further complicating the chain of command involved in the project. The most prominent of these, Technodyne, received $450 million in funds from the city. When the U.S. Attorney's office released its indictments, Technodyne's owners, Reedy and Padma Allen, fled the country and are believed to be at large in India. Today, over 150,000 city workers use CityTime to keep track of attendance and leave of absence requests, but the cost per user for the project is estimated to be approximately $4,000. The industry standard for projects of this size is between $200 and $1,000 dollars. New York State has developed a much more complicated system to perform similar tasks for only $217 million, which makes CityTime's $720 million price tag look even worse by comparison.

In March 2012, the city received some good news: SAIC agreed to repay $500 million in restitution and penalties back to the city to avoid federal prosecution for various instances of fraud involving the CityTime project. Although the result will lessen the burden of the project on taxpayers, the scandal nevertheless is a black mark for Bloomberg and his goals to modernize city information systems, and there is some doubt about how much of the sum that SAIC will actually be able to pay.

The New York City Council also called a hearing to respond to the budget-crippling cost overruns of both projects. The Bloomberg administration vowed

once again to review the way it handles complex, multi-million dollar technology projects. Proposed changes included first looking for commercial software before developing customized software without a real need for it. The city also stated that it would bill contractors as functional benchmarks for projects are achieved instead of hourly, to avoid future partnerships like Accenture and SAIC, and would ensure that multi-million dollar technology projects are overseen by qualified experts, instead of government administrators from other areas with no project management experience.

Sources: "CityTime," *The New York Times*, March 14, 2012; Michael M. Grynbaum, "Contractor Strikes $500 Million Deal in City Payroll Scandal," *The New York Times*, March 14, 2012; David M. Halbfinger, "For Mayor, Waste Mars Another Digital Project," *The New York Times*, September 23, 2011 and "City Hall Admits Mishandling Technology Projects," *The New York Times,* October 31, 2011; Josh Margolin, "277M Overrun a City 'Soar' Point," *The New York Post*, August 11, 2011; Robert Charette, "New York City's $720 Million CityTime Project a Vehicle for Unprecedented Fraud Says US Prosecutor," IEEE Spectrum, June 21, 2011; David W. Chen, Serge F. Kovaleski and John Eligon, "Behind Troubled City Payroll Project, Lax Oversight and One Powerful Insider," *The New York Times*, March 27, 2011.

CASE STUDY QUESTIONS

1. How important were the NYCAPS and CityTime projects for New York City? What were their objectives? What would have been their business benefits?
2. Evaluate the key risk factors in both projects.
3. Classify and describe the problems each project encountered as the NYCAPS and CityTime systems were being implemented. What management, organization, and technology factors were responsible for these problems?
4. What were the similarities and differences in the management of both projects?
5. What was the business impact of these botched implementations? Explain your answer.
6. Describe the steps that should have been taken to prevent negative outcomes in these projects.

Chapter 15

Managing Global Systems

LEARNING OBJECTIVES

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

1. What major factors are driving the internationalization of business?
2. What are the alternative strategies for developing global businesses?
3. How can information systems support different global business strategies?
4. What are the challenges posed by global information systems and management solutions for these challenges?
5. What are the issues and technical alternatives to be considered when developing international information systems?

Interactive Sessions:

Fonterra: Managing the World's Milk Trade

How Cell Phones Support Economic Development

CHAPTER OUTLINE

3M: STICKY FILM AND SCRATCHY THINGS THAT SELL AROUND THE WORLD

3M is a diversified technology company with a global presence. Its products are available in 200 countries, it has operations in 62 counties, and it produces over 55,000 products. In 2009, the company generated $23.1 billion in revenue, down from $25.6 billion (8 percent) in 2008 as the global recession slowed business activity. The company employs 76,000 people. 3M, headquartered in St. Paul, Minnesota, is the poster-child for global American firms: 63 percent of its revenue comes from offshore sales (14.6 billion), and 58 percent of its employees are international.

3M's core competencies historically have been sticky films and scratchy papers (sandpaper), and, since its founding in 1902, has continuously demonstrated through new products just how much the world depends on these competencies. 3M is organized into six largely independent divisions: Industrial and Transportation (tapes, abrasives, and adhesives); Health Care (surgical tapes to dental inserts); Consumer and Office (furnace filters to Post-it notes and Scotchbrite pads); Safety, Security, and Protection Services (respirators to Thinsulite insulation and RFD equipment); Display and Graphics (LCD monitors to highway reflective tape) ; and Electro and Communications (insulating materials to disk drive lubricants). 3M is among the leading manufacturers of products for many of the markets it serves.

With such a large global presence, with many of its foreign operations the results of purchases, the company was until recently a collection of legacy applications spread across the globe. 3M inherited the hardware and software of acquired companies, from the shop floor, to supply chain, sales, office, and reporting systems. Even where 3M expanded organically by moving into new countries, each of the six divisions, and thousands of their smaller operations, developed their own information and reporting systems with very little corporate, global oversight. As one manager noted, if 3M continued to operate its business with an accumulation of disaggregated solutions, the company would not be able to efficiently operate in the current recession, or support future growth.

In 2008, 3M began a series of restructurings of its operations, including a review of its global systems. In 2010, 3M adopted SAP's Business Suite Applications to replace all of its legacy software around the world. The intent is to transform its business processes on a global scale, and force independent divisions to adopt common software tools and, more importantly, common business processes. The price tag is also global: licensing fees paid to SAP are reported as somewhere between $35 million to $75 million.

Business Suite 7 is SAP's brand of enterprise systems. It consists of five integrated modules that can be run on a wide variety of hardware platforms, and which work well with software from other vendors. The core business process and software modules are customer relationship management (CRM), enterprise resource planning (ERP), product lifecycle management, supply chain

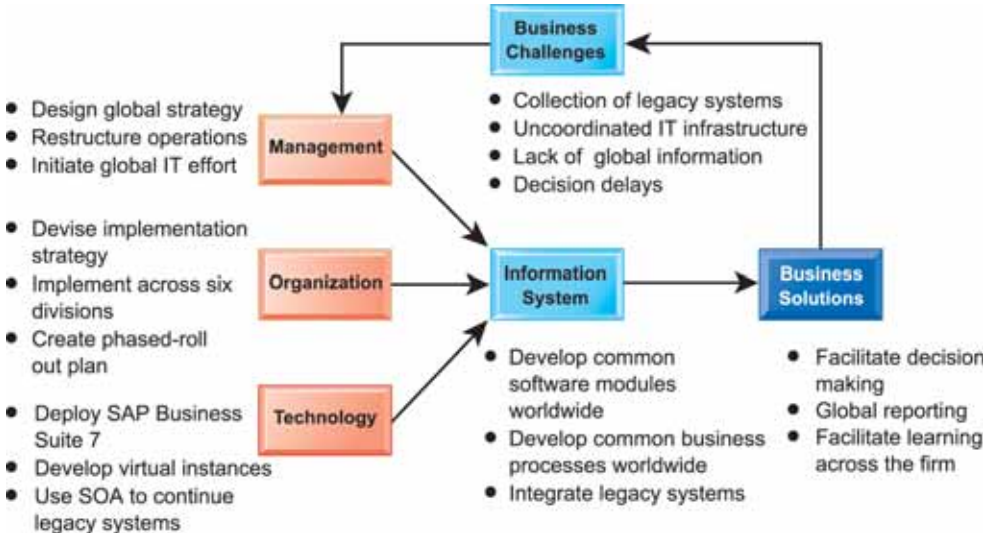
management (SCM), and supplier relationship management. Each module has pre-defined business processes, and the software needed to support these processes. Firms adapt their own business processes to these "industry best-practice modules," or make changes in the SAP software to fit their business models. Business Suite is built on a service-oriented architecture (SOA), which means it can work well with data from legacy database systems and offers lower implementation costs.

In implementing SAP's Business Suite, 3M is not following in the footsteps of some ill-fated global system initiatives by other Fortune 500 companies. Rather than do a "rip, burn, replace" of all its old software, 3M is rolling out the SAP enterprise software in phased and modular stages. Following a piecemeal approach, it is rolling out a demand forecasting and supply planning module in Europe first, and then once the concept is validated, additional rollouts will follow around the world. In Asia-Pacific, 3M is implementing its ERP system over the next several years. In the past, executive managers in the United States did not have timely, accurate, or consistent information on how all the firms business units, regions, and products were performing. To a large extent, 3M was not manageable or governable prior to the current effort to rationalize its systems. One solution will be SAP's business intelligence (BI) software which will enable 3M's management to access accurate and timely data on business performance across its divisions to support informed decision making. The SAP software agreement enables 3M to integrate the best practices it has gained with its existing BI deployments from the SAP BusinessObject portfolio in the United States and in other regions into the global rollout template. One advantage of having integrated global systems is the ability to transfer what you learn in one region to another region. In a further sign that 3M management has a keen understanding of corporate structure and strategy, the firm plans to maintain a large measure of independence among the six divisions because their histories and products are so different. It will not force the divisions to adopt a single instance of the SAP products but instead will allow substantial variation among divisions, what one wag called "virtual instances" of the software that reflect the needs of customers served by the various divisions.

Sources: Chris Chiappinelli, "3M Selects SAP Business Suite in Effort to Unify Its Core Processes," *Managing Automation*, April 4, 2010; Doug Henschen, "SAP ERP Software Tapped by 3M," *Information Week*, March 1, 2010; "SAP Gains 3M as New Customer," www.sap.com, March 1, 2010; 3M, Form 10K For the Fiscal Year Ended December 31, 2009, filed with the Securities and Exchange Commission February 16, 2010.

3M's efforts to create a global IT infrastructure identifies some of the issues that truly global organizations need to consider if they want to operate across the globe. Like many large, multinational firms, 3M grew rapidly by purchasing other businesses in foreign countries, as well as through expanding domestic operations to foreign countries In the process, 3M inherited hundreds of legacy software systems, and developed new systems, few of which could share information with one another, or report consistent information to corporate headquarters. 3M's legacy information systems simply could not support timely management decision making on a global scale.

The chapter-opening diagram calls attention to important points raised by this case and this chapter. To solve its global management and business challenges, 3M adopted an integrated suite of software applications from SAP, one of the world's largest software firms. 3M had to devise a flexible, modular implementation strategy that integrated both the existing legacy systems, and preserved some measure of autonomy for the six divisions that are the basis of the company. 3M is now able to respond to changes in business conditions around the globe and around the clock.

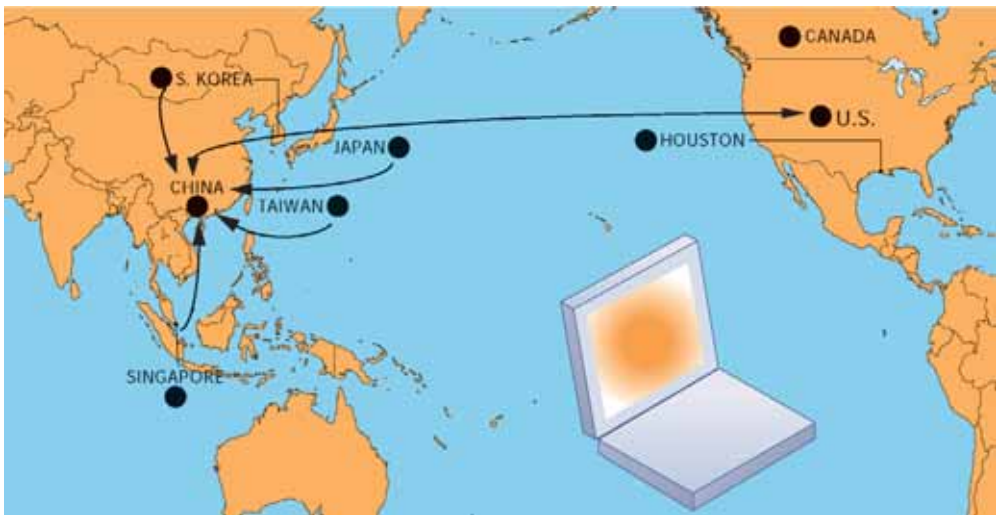


15.1 The Growth of International Information Systems

In earlier chapters, we describe the emergence of a global economic system and global world order driven by advanced networks and information systems. The new world order is sweeping away many national corporations, national industries, and national economies controlled by domestic politicians. Many localized firms will be replaced by fast-moving networked corporations that transcend national boundaries. The growth of international trade has radically altered domestic economies around the globe.

Today, the production and design of many electronic products are parceled out to a number of different countries. Consider the path to market for a Hewlett-Packard (HP) laptop computer, which is illustrated in Figure 15-1.

FIGURE 15-1 AN HP LAPTOP'S PATH TO MARKET



HP and other electronics companies assign distribution and production of their products to a number of different countries.

The idea for the product and initial design came from HP's Laptop Design Team in the United States. HP headquarters in Houston approved the concept. Graphics processors were designed in Canada and manufactured in Taiwan. Taiwan and South Korea provided the liquid-crystal display (LCD) screens and many of the memory chips. The laptop's hard disk drive came from Japan. Sources in China, Japan, Singapore, South Korea, and the United States supplied other components. Laptop assembly took place in China. Contractors in Taiwan did the machine's engineering design and collaborated with the Chinese manufacturers.

DEVELOPING AN INTERNATIONAL INFORMATION SYSTEMS ARCHITECTURE

This chapter describes how to go about building an international information systems architecture suitable for your international strategy. An **international information systems architecture** consists of the basic information systems required by organizations to coordinate worldwide trade and other activities. Figure 15-2 illustrates the reasoning we follow throughout the chapter and depicts the major dimensions of an international information systems architecture.

The basic strategy to follow when building an international system is to understand the global environment in which your firm is operating. This means understanding the overall market forces, or business drivers, that are pushing your industry toward global competition. A **business driver** is a force in the environment to which businesses must respond and that influences the direction of the business. Likewise, examine carefully the inhibitors or negative factors that create *management challenges*—factors that could scuttle the development of a global business. Once you have examined the global environment, you will need to consider a corporate strategy for competing in that environ-

FIGURE 15-2 INTERNATIONAL INFORMATION SYSTEMS ARCHITECTURE

The major dimensions for developing an international information systems architecture are the global environment, the corporate global strategies, the structure of the organization, the management and business processes, and the technology platform.

ment. How will your firm respond? You could ignore the global market and focus on domestic competition only, sell to the globe from a domestic base, or organize production and distribution around the globe. There are many in-between choices.

After you have developed a strategy, it is time to consider how to structure your organization so it can pursue the strategy. How will you accomplish a division of labor across a global environment? Where will production, administration, accounting, marketing, and human resource functions be located? Who will handle the systems function?

Next, you must consider the management issues in implementing your strategy and making the organization design come alive. Key here will be the design of business processes. How can you discover and manage user requirements? How can you induce change in local units to conform to international requirements? How can you reengineer on a global scale, and how can you coordinate systems development?

The last issue to consider is the technology platform. Although changing technology is a key driving factor leading toward global markets, you need to have a corporate strategy and structure before you can rationally choose the right technology.

After you have completed this process of reasoning, you will be well on your way toward an appropriate international information systems portfolio capable of achieving your corporate goals. Let's begin by looking at the overall global environment.

THE GLOBAL ENVIRONMENT: BUSINESS DRIVERS AND CHALLENGES

Table 15-1 lists the business drivers in the global environment that are leading all industries toward global markets and competition.

The global business drivers can be divided into two groups: general cultural factors and specific business factors. Easily recognized general cultural factors have driven internationalization since World War II. Information, communication, and transportation technologies have created a *global village* in which communication (by telephone, television, radio, or computer network) around the globe is no more difficult and not much more expensive than communication down the block. The cost of moving goods and services to and from geographically dispersed locations has fallen dramatically.

The development of global communications has created a global village in a second sense: A **global culture** created by television, the Internet, and other

TABLE 15-1 THE GLOBAL ENVIRONMENT: BUSINESS DRIVERS AND CHALLENGES

GENERAL CULTURAL FACTORS	SPECIFIC BUSINESS FACTORS
Global communication and transportation technologies	Global markets
Development of global culture	Global production and operations
Emergence of global social norms	Global coordination
Political stability	Global workforce
Global knowledge base	Global economies of scale

globally shared media such as movies now permits different cultures and peoples to develop common expectations about right and wrong, desirable and undesirable, heroic and cowardly. The collapse of the Eastern bloc has speeded the growth of a world culture enormously, increased support for capitalism and business, and reduced the level of cultural conflict considerably.

A last factor to consider is the growth of a global knowledge base. At the end of World War II, knowledge, education, science, and industrial skills were highly concentrated in North America, western Europe, and Japan, with the rest of the world euphemistically called the *Third World*. This is no longer true. Latin America, China, India, southern Asia, and eastern Europe have developed powerful educational, industrial, and scientific centers, resulting in a much more democratically and widely dispersed knowledge base.

These general cultural factors leading toward internationalization result in specific business globalization factors that affect most industries. The growth of powerful communications technologies and the emergence of world cultures lay the groundwork for *global markets*—global consumers interested in consuming similar products that are culturally approved. Coca-Cola, American sneakers (made in Korea but designed in Los Angeles), and Cable News Network (CNN) programming can now be sold in Latin America, Africa, and Asia.

Responding to this demand, global production and operations have emerged with precise online coordination between far-flung production facilities and central headquarters thousands of miles away. At Sealand Transportation, a major global shipping company based in Newark, New Jersey, shipping managers in Newark can watch the loading of ships in Rotterdam online, check trim and ballast, and trace packages to specific ship locations as the activity proceeds. This is all possible through an international satellite link.

The new global markets and pressure toward global production and operation have called forth whole new capabilities for global coordination. Production, accounting, marketing and sales, human resources, and systems development (all the major business functions) can be coordinated on a global scale.

Frito Lay, for instance, can develop a marketing sales force automation system in the United States and, once provided, may try the same techniques and technologies in Spain. Micromarketing—marketing to very small geographic and social units—no longer means marketing to neighborhoods in the United States, but to neighborhoods throughout the world! These new levels of global coordination permit for the first time in history the location of business activity according to comparative advantage. Design should be located where it is best accomplished, as should marketing, production, and finance.

Finally, global markets, production, and administration create the conditions for powerful, sustained global economies of scale. Production driven by worldwide global demand can be concentrated where it can best be accomplished, fixed resources can be allocated over larger production runs, and production runs in larger plants can be scheduled more efficiently and precisely estimated. Lower cost factors of production can be exploited wherever they emerge. The result is a powerful strategic advantage to firms that can organize globally. These general and specific business drivers have greatly enlarged world trade and commerce.

Not all industries are similarly affected by these trends. Clearly, manufacturing has been much more affected than services that still tend to be domestic

and highly inefficient. However, the localism of services is breaking down in telecommunications, entertainment, transportation, finance, law, and general business. Clearly, those firms within an industry that can understand the internationalization of the industry and respond appropriately will reap enormous gains in productivity and stability.

Business Challenges

Although the possibilities of globalization for business success are significant, fundamental forces are operating to inhibit a global economy and to disrupt international business. Table 15-2 lists the most common and powerful challenges to the development of global systems.

At a cultural level, **particularism**, making judgments and taking action on the basis of narrow or personal characteristics, in all its forms (religious, nationalistic, ethnic, regionalism, geopolitical position) rejects the very concept of a shared global culture and rejects the penetration of domestic markets by foreign goods and services. Differences among cultures produce differences in social expectations, politics, and ultimately legal rules. In certain countries, such as the United States, consumers expect domestic name-brand products to be built domestically and are disappointed to learn that much of what they thought of as domestically produced is in fact foreign made.

Different cultures produce different political regimes. Among the many different countries of the world are different laws governing the movement of information, information privacy of their citizens, origins of software and hardware in systems, and radio and satellite telecommunications. Even the hours of business and the terms of business trade vary greatly across political cultures. These different legal regimes complicate global business and must be considered when building global systems.

For instance, European countries have very strict laws concerning transborder data flow and privacy. **Transborder data flow** is defined as the movement of information across international boundaries in any form. Some European countries prohibit the processing of financial information outside their boundaries or the movement of personal information to foreign countries. The European Union Data Protection Directive, which went into effect in October 1998, restricts the flow of any information to countries (such as the United States) that do not meet strict European information laws on personal information. Financial services, travel, and health care companies are often directly affected. In response, most multinational firms develop information systems within each European country to avoid the cost and uncertainty of moving information across national boundaries.

TABLE 15-2 CHALLENGES AND OBSTACLES TO GLOBAL BUSINESS SYSTEMS

GLOBAL	SPECIFIC
Cultural particularism: Regionalism, nationalism, language differences	Standards: Different Electronic Data Interchange (EDI), e-mail, telecommunications standards
Social expectations: Brand-name expectations, work hours	Reliability: Phone networks not uniformly reliable
Political laws: Transborder data and privacy laws, commercial regulations	Speed: Different data transfer speeds, many slower than United States
	Personnel: Shortages of skilled consultants

Cultural and political differences profoundly affect organizations' business processes and applications of information technology. A host of specific barriers arise from the general cultural differences, everything from different reliability of phone networks to the shortage of skilled consultants.

National laws and traditions have created disparate accounting practices in various countries, which impact the ways profits and losses are analyzed. German companies generally do not recognize the profit from a venture until the project is completely finished and they have been paid. Conversely, British firms begin posting profits before a project is completed, when they are reasonably certain they will get the money.

These accounting practices are tightly intertwined with each country's legal system, business philosophy, and tax code. British, U.S., and Dutch firms share a predominantly Anglo-Saxon outlook that separates tax calculations from reports to shareholders to focus on showing shareholders how fast profits are growing. Continental European accounting practices are less oriented toward impressing investors, focusing rather on demonstrating compliance with strict rules and minimizing tax liabilities. These diverging accounting practices make it difficult for large international companies with units in different countries to evaluate their performance.

Language remains a significant barrier. Although English has become a kind of standard business language, this is truer at higher levels of companies and not throughout the middle and lower ranks. Software may have to be built with local language interfaces before a new information system can be successfully implemented.

Currency fluctuations can play havoc with planning models and projections. A product that appears profitable in Mexico or Japan may actually produce a loss because of changes in foreign exchange rates.

These inhibiting factors must be taken into account when you are designing and building international systems for your business. For example, companies trying to implement "lean production" systems spanning national boundaries typically underestimate the time, expense, and logistical difficulties of making goods and information flow freely across different countries.

STATE OF THE ART

One might think, given the opportunities for achieving competitive advantages as outlined previously and the interest in future applications, that most international companies have rationally developed marvelous international systems architectures. Nothing could be further from the truth. Most companies have inherited patchwork international systems from the distant past, often based on concepts of information processing developed in the 1960s—batch-oriented reporting from independent foreign divisions to corporate headquarters, manual entry of data from one legacy system to another, with little online control and communication. Corporations in this situation increasingly face powerful competitive challenges in the marketplace from firms that have rationally designed truly international systems. Still other companies have recently built technology platforms for international systems but have nowhere to go because they lack global strategy.

As it turns out, there are significant difficulties in building appropriate international architectures. The difficulties involve planning a system appropriate to the firm's global strategy, structuring the organization of systems and business units, solving implementation issues, and choosing the right technical platform. Let's examine these problems in greater detail.

15.2 Organizing International Information Systems

Three organizational issues face corporations seeking a global position: choosing a strategy, organizing the business, and organizing the systems management area. The first two are closely connected, so we discuss them together.

GLOBAL STRATEGIES AND BUSINESS ORGANIZATION

Four main global strategies form the basis for global firms' organizational structure. These are domestic exporter, multinational, franchiser, and transnational. Each of these strategies is pursued with a specific business organizational structure (see Table 15-3). For simplicity's sake, we describe three kinds of organizational structure or governance: centralized (in the home country), decentralized (to local foreign units), and coordinated (all units participate as equals). Other types of governance patterns can be observed in specific companies (e.g., authoritarian dominance by one unit, a confederacy of equals, a federal structure balancing power among strategic units, and so forth).

The **domestic exporter** strategy is characterized by heavy centralization of corporate activities in the home country of origin. Nearly all international companies begin this way, and some move on to other forms. Production, finance/accounting, sales/marketing, human resources, and strategic management are set up to optimize resources in the home country. International sales are sometimes dispersed using agency agreements or subsidiaries, but even here, foreign marketing relies on the domestic home base for marketing themes and strategies. Caterpillar Corporation and other heavy capital-equipment manufacturers fall into this category of firm.

The **multinational** strategy concentrates financial management and control out of a central home base while decentralizing production, sales, and marketing operations to units in other countries. The products and services on sale in different countries are adapted to suit local market conditions. The organization becomes a far-flung confederation of production and marketing facilities in different countries. Many financial service firms, along with a host of manufacturers, such as General Motors, Chrysler, and Intel, fit this pattern.

Franchisers are an interesting mix of old and new. On the one hand, the product is created, designed, financed, and initially produced in the home country, but for product-specific reasons must rely heavily on foreign personnel for further production, marketing, and human resources. Food franchisers such

TABLE 15-3 GLOBAL BUSINESS STRATEGY AND STRUCTURE

BUSINESS FUNCTION	DOMESTIC EXPORTER	MULTINATIONAL	FRANCHISER	TRANSNATIONAL
Production	Centralized	Dispersed	Coordinated	Coordinated
Finance/Accounting	Centralized	Centralized	Centralized	Coordinated
Sales/Marketing	Mixed	Dispersed	Coordinated	Coordinated
Human Resources	Centralized	Centralized	Coordinated	Coordinated
Strategic Management	Centralized	Centralized	Centralized	Coordinated

as McDonald's, Mrs. Fields Cookies, and KFC fit this pattern. McDonald's created a new form of fast-food chain in the United States and continues to rely largely on the United States for inspiration of new products, strategic management, and financing. Nevertheless, because the product must be produced locally—it is perishable—extensive coordination and dispersal of production, local marketing, and local recruitment of personnel are required.

Generally, foreign franchisees are clones of the mother country units, but fully coordinated worldwide production that could optimize factors of production is not possible. For instance, potatoes and beef can generally not be bought where they are cheapest on world markets but must be produced reasonably close to the area of consumption.

Transnational firms are the stateless, truly globally managed firms that may represent a larger part of international business in the future. Transnational firms have no single national headquarters but instead have many regional headquarters and perhaps a world headquarters. In a **transnational** strategy, nearly all the value-adding activities are managed from a global perspective without reference to national borders, optimizing sources of supply and demand wherever they appear, and taking advantage of any local competitive advantages. Transnational firms take the globe, not the home country, as their management frame of reference. The governance of these firms has been likened to a federal structure in which there is a strong central management core of decision making, but considerable dispersal of power and financial muscle throughout the global divisions. Few companies have actually attained transnational status, but Citicorp, Sony, Ford, and others are attempting this transition.

Information technology and improvements in global telecommunications are giving international firms more flexibility to shape their global strategies. Protectionism and a need to serve local markets better encourage companies to disperse production facilities and at least become multinational. At the same time, the drive to achieve economies of scale and take advantage of short-term local advantage moves transnationals toward a global management perspective and a concentration of power and authority. Hence, there are forces of decentralization and dispersal, as well as forces of centralization and global coordination.

GLOBAL SYSTEMS TO FIT THE STRATEGY

Information technology and improvements in global telecommunications are giving international firms more flexibility to shape their global strategies. The configuration, management, and development of systems tend to follow the global strategy chosen. Figure 15-3 depicts the typical arrangements. By *systems* we mean the full range of activities involved in building and operating information systems: conception and alignment with the strategic business plan, systems development, and ongoing operation and maintenance. For the sake of simplicity, we consider four types of systems configuration. *Centralized systems* are those in which systems development and operation occur totally at the domestic home base. *Duplicated systems* are those in which development occurs at the home base but operations are handed over to autonomous units in foreign locations. *Decentralized systems* are those in which each foreign unit designs its own unique solutions and systems. *Networked systems* are those in which systems development and operations occur in an integrated and coordinated fashion across all units.

FIGURE 15-3 GLOBAL STRATEGY AND SYSTEMS CONFIGURATIONS

SYSTEM CONFIGURATION	Strategy			
	Domestic Exporter	Multinational	Franchiser	Transnational
Centralized	X			
Duplicated			X	
Decentralized	x	X	x	
Networked		x		X

The large Xs show the dominant patterns, and the small Xs show the emerging patterns. For instance, domestic exporters rely predominantly on centralized systems, but there is continual pressure and some development of decentralized systems in local marketing regions.

As can be seen in Figure 15-3, domestic exporters tend to have highly centralized systems in which a single domestic systems development staff develops worldwide applications. Multinationals offer a direct and striking contrast: Here, foreign units devise their own systems solutions based on local needs with few if any applications in common with headquarters (the exceptions being financial reporting and some telecommunications applications). Franchisers have the simplest systems structure: Like the products they sell, franchisers develop a single system usually at the home base and then replicate it around the world. Each unit, no matter where it is located, has identical applications. Last, the most ambitious form of systems development is found in transnational firms: Networked systems are those in which there is a solid, singular global environment for developing and operating systems. This usually presupposes a powerful telecommunications backbone, a culture of shared applications development, and a shared management culture that crosses cultural barriers. The networked systems structure is the most visible in financial services where the homogeneity of the product—money and money instruments—seems to overcome cultural barriers.

REORGANIZING THE BUSINESS

How should a firm organize itself for doing business on an international scale? To develop a global company and information systems support structure, a firm needs to follow these principles:

1. Organize value-adding activities along lines of comparative advantage. For instance, marketing/sales functions should be located where they can best be performed, for least cost and maximum impact; likewise with production, finance, human resources, and information systems.
2. Develop and operate systems units at each level of corporate activity—regional, national, and international. To serve local needs, there should be *host country systems units* of some magnitude. *Regional systems units* should handle telecommunications and systems development across national boundaries that take place within major geographic regions (European, Asian, American). *Transnational systems units* should be established to create the linkages across major regional areas and coordinate the development and operation of international telecommunications and systems development (Roche, 1992).

3. Establish at world headquarters a single office responsible for development of international systems—a global chief information officer (CIO) position.

Many successful companies have devised organizational systems structures along these principles. The success of these companies relies not only on the proper organization of activities, but also on a key ingredient—a management team that can understand the risks and benefits of international systems and that can devise strategies for overcoming the risks. We turn to these management topics next.

15.3 Managing Global Systems

Table 15-4 lists the principal management problems posed by developing international systems. It is interesting to note that these problems are the chief difficulties managers experience in developing ordinary domestic systems as well. But these are enormously complicated in the international environment.

A TYPICAL SCENARIO: DISORGANIZATION ON A GLOBAL SCALE

Let's look at a common scenario. A traditional multinational consumer-goods company based in the United States and operating in Europe would like to expand into Asian markets and knows that it must develop a transnational strategy and a supportive information systems structure. Like most multinationals, it has dispersed production and marketing to regional and national centers while maintaining a world headquarters and strategic management in the United States. Historically, it has allowed each of the subsidiary foreign divisions to develop its own systems. The only centrally coordinated system is financial controls and reporting. The central systems group in the United States focuses only on domestic functions and production.

The result is a hodgepodge of hardware, software, and telecommunications. The e-mail systems between Europe and the United States are incompatible. Each production facility uses a different manufacturing resources planning system (or a different version of the same ERP system), and different marketing, sales, and human resource systems. Hardware and database platforms are wildly different. Communications between different sites are poor, given the high cost of European intercountry communications. The central systems group at headquarters in the United States recently was decimated and dis-

TABLE 15-4 MANAGEMENT CHALLENGES IN DEVELOPING GLOBAL SYSTEMS

Agreeing on common user requirements
Introducing changes in business processes
Coordinating applications development
Coordinating software releases
Encouraging local users to support global systems.

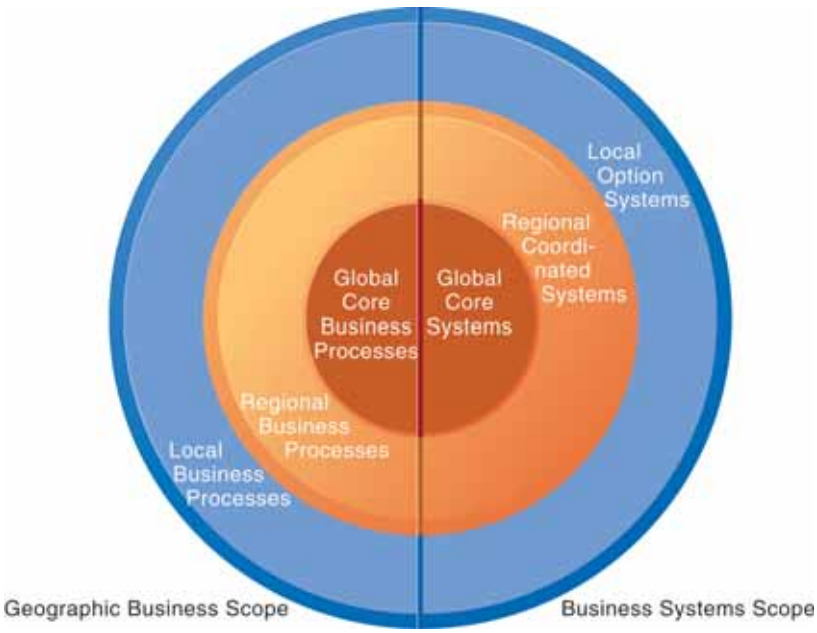
persed to the U.S. local sites in the hope of serving local needs better and reducing costs.

What do you recommend to the senior management leaders of this company, who now want to pursue a transnational strategy and develop an information systems architecture to support a highly coordinated global systems environment? Consider the problems you face by reexamining Table 15-4. The foreign divisions will resist efforts to agree on common user requirements; they have never thought about much other than their own units' needs. The systems groups in American local sites, which have been enlarged recently and told to focus on local needs, will not easily accept guidance from anyone recommending a transnational strategy. It will be difficult to convince local managers anywhere in the world that they should change their business procedures to align with other units in the world, especially if this might interfere with their local performance. After all, local managers are rewarded in this company for meeting local objectives of their division or plant. Finally, it will be difficult to coordinate development of projects around the world in the absence of a powerful telecommunications network and, therefore, difficult to encourage local users to take on ownership in the systems developed.

GLOBAL SYSTEMS STRATEGY

Figure 15-4 lays out the main dimensions of a solution. First, consider that not all systems should be coordinated on a transnational basis; only some core

FIGURE 15-4 LOCAL, REGIONAL, AND GLOBAL SYSTEMS



Agency and other coordination costs increase as the firm moves from local option systems toward regional and global systems. However, transaction costs of participating in global markets probably decrease as firms develop global systems. A sensible strategy is to reduce agency costs by developing only a few core global systems that are vital for global operations, leaving other systems in the hands of regional and local units.

Source: From *Managing Information Technology in Multinational Corporations* by Edward M. Roche, © 1993. Adapted by permission of Prentice Hall, Inc., Upper Saddle River, N.J.

systems are truly worth sharing from a cost and feasibility point of view. **Core systems** support functions that are absolutely critical to the organization. Other systems should be partially coordinated because they share key elements, but they do not have to be totally common across national boundaries. For such systems, a good deal of local variation is possible and desirable. A final group of systems is peripheral, truly provincial, and needed to suit local requirements only.

Define the Core Business Processes

How do you identify core systems? The first step is to define a short list of critical core business processes. Business processes are defined and described in Chapter 2, which you should review. Briefly, business processes are sets of logically related tasks to produce specific business results, such as shipping out correct orders to customers or delivering innovative products to the market. Each business process typically involves many functional areas, communicating and coordinating work, information, and knowledge.

The way to identify these core business processes is to conduct a business process analysis. How are customer orders taken, what happens to them once they are taken, who fills the orders, how are they shipped to the customers? What about suppliers? Do they have access to manufacturing resource planning systems so that supply is automatic? You should be able to identify and set priorities in a short list of 10 business processes that are absolutely critical for the firm.

Next, can you identify centers of excellence for these processes? Is the customer order fulfillment superior in the United States, manufacturing process control superior in Germany, and human resources superior in Asia? You should be able to identify some areas of the company, for some lines of business, where a division or unit stands out in the performance of one or several business functions.

When you understand the business processes of a firm, you can rank-order them. You then can decide which processes should be core applications, centrally coordinated, designed, and implemented around the globe, and which should be regional and local. At the same time, by identifying the critical business processes, the really important ones, you have gone a long way to defining a vision of the future that you should be working toward.

Identify the Core Systems to Coordinate Centrally

By identifying the critical core business processes, you begin to see opportunities for transnational systems. The second strategic step is to conquer the core systems and define these systems as truly transnational. The financial and political costs of defining and implementing transnational systems are extremely high. Therefore, keep the list to an absolute minimum, letting experience be the guide and erring on the side of minimalism. By dividing off a small group of systems as absolutely critical, you divide opposition to a transnational strategy. At the same time, you can appease those who oppose the central worldwide coordination implied by transnational systems by permitting peripheral systems development to progress unabated, with the exception of some technical platform requirements.

Choose an Approach: Incremental, Grand Design, Evolutionary

A third step is to choose an approach. Avoid piecemeal approaches. These surely will fail for lack of visibility, opposition from all who stand to lose from

transnational development, and lack of power to convince senior management that the transnational systems are worth it. Likewise, avoid grand design approaches that try to do everything at once. These also tend to fail, because of an inability to focus resources. Nothing gets done properly, and opposition to organizational change is needlessly strengthened because the effort requires huge resources. An alternative approach is to evolve transnational applications incrementally from existing applications with a precise and clear vision of the transnational capabilities the organization should have in five years. This is sometimes referred to as the "salami strategy," or one slice at a time.

Make the Benefits Clear

What is in it for the company? One of the worst situations to avoid is to build global systems for the sake of building global systems. From the beginning, it is crucial that senior management at headquarters and foreign division managers clearly understand the benefits that will come to the company as well as to individual units. Although each system offers unique benefits to a particular budget, the overall contribution of global systems lies in four areas.

Global systems—truly integrated, distributed, and transnational systems—contribute to superior management and coordination. A simple price tag cannot be put on the value of this contribution, and the benefit will not show up in any capital budgeting model. It is the ability to switch suppliers on a moment's notice from one region to another in a crisis, the ability to move production in response to natural disasters, and the ability to use excess capacity in one region to meet raging demand in another.

A second major contribution is vast improvement in production, operation, and supply and distribution. Imagine a global value chain, with global suppliers and a global distribution network. For the first time, senior managers can locate value-adding activities in regions where they are most economically performed.

Third, global systems mean global customers and global marketing. Fixed costs around the world can be amortized over a much larger customer base. This will unleash new economies of scale at production facilities.

Last, global systems mean the ability to optimize the use of corporate funds over a much larger capital base. This means, for instance, that capital in a surplus region can be moved efficiently to expand production of capital-starved regions; that cash can be managed more effectively within the company and put to use more effectively.

These strategies will not by themselves create global systems. You will have to implement what you strategize.

THE MANAGEMENT SOLUTION: IMPLEMENTATION

We now can reconsider how to handle the most vexing problems facing managers developing the global information systems architectures that were described in Table 15-4.

Agreeing on Common User Requirements

Establishing a short list of the core business processes and core support systems will begin a process of rational comparison across the many divisions of the company, develop a common language for discussing the business, and naturally lead to an understanding of common elements (as well as the unique qualities that must remain local).

Introducing Changes in Business Processes

Your success as a change agent will depend on your legitimacy, your authority, and your ability to involve users in the change design process. **Legitimacy** is defined as the extent to which your authority is accepted on grounds of competence, vision, or other qualities. The selection of a viable change strategy, which we have defined as evolutionary but with a vision, should assist you in convincing others that change is feasible and desirable. Involving people in change, assuring them that change is in the best interests of the company and their local units, is a key tactic.

Coordinating Applications Development

Choice of change strategy is critical for this problem. At the global level there is far too much complexity to attempt a grand design strategy of change. It is far easier to coordinate change by making small incremental steps toward a larger vision. Imagine a five-year plan of action rather than a two-year plan of action, and reduce the set of transnational systems to a bare minimum to reduce coordination costs.

Coordinating Software Releases

Firms can institute procedures to ensure that all operating units convert to new software updates at the same time so that everyone's software is compatible.

Encouraging Local Users to Support Global Systems

The key to this problem is to involve users in the creation of the design without giving up control over the development of the project to parochial interests. The overall tactic for dealing with resistant local units in a transnational company is cooptation. **Cooptation** is defined as bringing the opposition into the process of designing and implementing the solution without giving up control over the direction and nature of the change. As much as possible, raw power should be avoided. Minimally, however, local units must agree on a short list of transnational systems, and raw power may be required to solidify the idea that transnational systems of some sort are truly required.

How should cooptation proceed? Several alternatives are possible. One alternative is to permit each country unit the opportunity to develop one transnational application first in its home territory, and then throughout the world. In this manner, each major country systems group is given a piece of the action in developing a transnational system, and local units feel a sense of ownership in the transnational effort. On the downside, this assumes the ability to develop high-quality systems is widely distributed, and that, a German team, for example, can successfully implement systems in France and Italy. This will not always be the case.

A second tactic is to develop new transnational centers of excellence, or a single center of excellence. There may be several centers around the globe that focus on specific business processes. These centers draw heavily from local national units, are based on multinational teams, and must report to worldwide management. Centers of excellence perform the initial identification and specification of business processes, define the information requirements, perform the business and systems analysis, and accomplish all design and testing. Implementation, however, and pilot testing are rolled out to other parts of the globe. Recruiting a wide range of local groups to transnational centers of excellence helps send the message that all significant groups are involved in the design and will have an influence.

INTERACTIVE SESSION: MANAGEMENT

FONTERRA: MANAGING THE WORLD'S MILK TRADE

While global trade has expanded at over 9 percent a year in the last 20 years, many international companies still rely on outdated manual processes and paperwork for conducting their international trade business. In 2010, global trade of goods and services will amount to a staggering $15 trillion. That's a little bigger than the entire United States economy ($14 trillion). There are many complex challenges that managers face when conducting business on an international scale. Chief among these challenges is managing the import and export business process. Managing an import/export business involves managing three processes: compliance with foreign and domestic laws, customs clearance procedures, and risk management. Each country you export to has different laws governing imported products and different customs procedures. Trading across boundaries raises financial and contractual risks. What if you export to a foreign company and it doesn't pay you? What kinds of credit assessments can you perform in various countries? What if your goods are stalled at a foreign port for lack of proper documents? What are the proper documents? The potential pitfalls are numerous.

In the past, time-consuming and error-prone manual methods were incapable of handling the complex challenges of global trade. To conduct business in other countries, your company must comply with local laws, satisfy trade security measures, meet documentation requirements, understand complicated tariffs and duties, and coordinate the involvement of all parties. Handling these responsibilities manually increases the risk of errors. According to a United Nations study, the inefficient administration of customs regulations and documents accounts for 7 percent of the cost of international trade. That's $1 trillion lost annually on a global basis to inefficient handling of customs documents. Poor management of compliance and risk accounts for even more losses.

Increasingly, international firms are turning to enterprise software and business intelligence applications to manage their import/export business processes on a global scale. One world, one business, one set of software tools with pre-defined business processes that are the same the world over. That's the dream. Fonterra provides an example of a firm (actually a cooperative) that is implementing an import/export process control system.

Fonterra is the world's leading exporter of dairy products. Owned by 11,000 New Zealand dairy farmers, Fonterra is a cooperative that exports 95 percent of its products to 140 countries—of all the dairy goods it manufactures, only 5 percent are consumed within its domestic market. Fonterra is primarily an exporting firm. Fonterra has $10 billion in assets, annual revenues of $12.1 billion, and produces 3.6 billion gallons of milk each year. If you wonder how that's possible, the answer is Fonterra relies on the contributions of 4.3 million New Zealand cows, and over 15,000 employees. Fonterra accounts for over 25 percent of New Zealand's export trade, and about 30 percent of all global trade in milk and milk products.

Fonterra's operations generate a substantial amount of transactional data. "The volume going through this platform is quite significant in both dollar and transactional terms," says Clyde Fletcher, Documentation Center Manager at Fonterra. "But we don't just rely on New Zealand. We procure our products from multiple countries to try to spread the risk. We also export out of Australia, the United States, Latin America, Europe, and Asia." This data needs to be captured in an enterprise database, then moved into a data warehouse so management can monitor the firms operations. To handle more complex import/export processes, Fonterra turned to the SAP BusinessObjects Global Trade Services solution.

SAP Global Trade Services (SAP GTS) automates import/export processes, while ensuring that transactions comply with all customs and security regulations. SAP GTS helps companies standardize and streamline trade processes across their entire enterprise and business units. And it fosters use of shared data and shared collaboration knowledge, replacing high-maintenance manual processes.

With SAP GTS, Fonterra has been able to lower the cost, and reduce the risk, of doing business internationally. To date, SAP GTS has helped Fonterra standardize and streamline trade processes across its entire enterprise and business units. And it has fostered the sharing of data, greater collaboration, and sharing of knowledge throughout the firm. SAP GTS manages the complexities of global trade and ensures

full regulatory compliance. The solution helps reduce buffer stock by improving transparency throughout the supply chain—sharing cross-border trade information will all partners, including freight forwarders, insurance agencies, banks, and regulatory entities. SAP GTS has helped Fonterra avoid supply chain bottlenecks, costly production downtime, and errors that can result in expensive penalties—and even revoked import/export privileges.

Sources: David Barboza, "Supply Chain for iPhone Highlights Costs in China," *New York Times*, July 5, 2010; Lauren Bonneau, "Mastering Global Trade at Fonterra," CustomProfiles, SAP.com, July 1, 2010; Kevin Keller, "iPhone Carries Bill of Materials of $187.51," iSuppli.com/Teardowns, June 28, 2010.

CASE STUDY QUESTIONS

1. Describe the various capabilities of SAP GTS. How does using this software help Fonterra manage its export trade? What quantifiable benefits does this system provide?
2. How would you characterize Fonterra's global business strategy and structure (review Table 15-3). What kind of a global business is it? Has Fonterra's structure and strategy shaped its uses of SAP GTS? Would a transnational company choose a different solution?
3. What influence does the global business environment have on firms like Fonterra, and how does that influence their choice of systems?

MIS IN ACTION

Explore Fonterra's Web site (Fonterra.com) and then answer the following questions:

1. Go the Web site SAP.com and search on "GTS." Click on the article entitled *"SAP GRC Global Trade Services: Streamline and Secure Your Global Supply Chain."* What benefits does SAP promise to deliver for global trading companies? Create a summary table for your class.
2. Visit SAP's largest competitor, Oracle.com, and identify similar applications provided by Oracle. What do you think are the most important management and business considerations in deciding between Oracle and SAP solutions for global projects? Discover one global firm that uses Oracle's global trade offerings, and compare that firm to Fonterra.

Even with the proper organizational structure and appropriate management choices, it is still possible to stumble over technology issues. Choices of technology platforms, networks, hardware, and software are the final element in building transnational information systems architectures.

15.4 Technology Issues and Opportunities for Global Value Chains

Once firms have defined a global business model and systems strategy, they must select hardware, software, and networking standards along with key system applications to support global business processes. Hardware, software, and networking pose special technical challenges in an international setting.

One major challenge is finding some way to standardize a global computing platform when there is so much variation from operating unit to operating unit and from country to country. Another major challenge is finding specific software applications that are user friendly and that truly enhance the produc-

tivity of international work teams. The universal acceptance of the Internet around the globe has greatly reduced networking problems. But the mere presence of the Internet does not guarantee that information will flow seamlessly throughout the global organization because not all business units use the same applications, and the quality of Internet service can be highly variable (just as with the telephone service). For instance, German business units may use an open source collaboration tool to share documents and communicate, which is incompatible with American headquarters teams, which use Lotus Notes. Overcoming these challenges requires systems integration and connectivity on a global basis.

COMPUTING PLATFORMS AND SYSTEMS INTEGRATION

The development of a transnational information systems architecture based on the concept of core systems raises questions about how the new core systems will fit in with the existing suite of applications developed around the globe by different divisions, different people, and for different kinds of computing hardware. The goal is to develop global, distributed, and integrated systems to support digital business processes spanning national boundaries. Briefly, these are the same problems faced by any large domestic systems development effort. However, the problems are magnified in an international environment. Just imagine the challenge of integrating systems based on the Windows, Linux, Unix, or proprietary operating systems running on IBM, Sun, HP, and other hardware in many different operating units in many different countries!

Moreover, having all sites use the same hardware and operating system does not guarantee integration. Some central authority in the firm must establish data standards, as well as other technical standards with which sites are to comply. For instance, technical accounting terms such as the beginning and end of the fiscal year must be standardized (review the earlier discussion of the cultural challenges to building global businesses), as well as the acceptable interfaces between systems, communication speeds and architectures, and network software.

CONNECTIVITY

Truly integrated global systems must have connectivity—the ability to link together the systems and people of a global firm into a single integrated network just like the phone system but capable of voice, data, and image transmissions. The Internet has provided an enormously powerful foundation for providing connectivity among the dispersed units of global firms. However, many issues remain. The public Internet does not guarantee any level of service (even in the U.S.). Few global corporations trust the security of the Internet and generally use private networks to communicate sensitive data, and Internet virtual private networks (VPNs) for communications that require less security. Not all countries support even basic Internet service that requires obtaining reliable circuits, coordinating among different carriers and the regional telecommunications authority, and obtaining standard agreements for the level of telecommunications service provided. Table 15-5 lists the major challenges posed by international networks.

While private networks have guaranteed service levels and better security than the Internet, the Internet is the primary foundation for global corporate networks when lower security and service levels are acceptable. Companies can create global intranets for internal communication or extranets to exchange

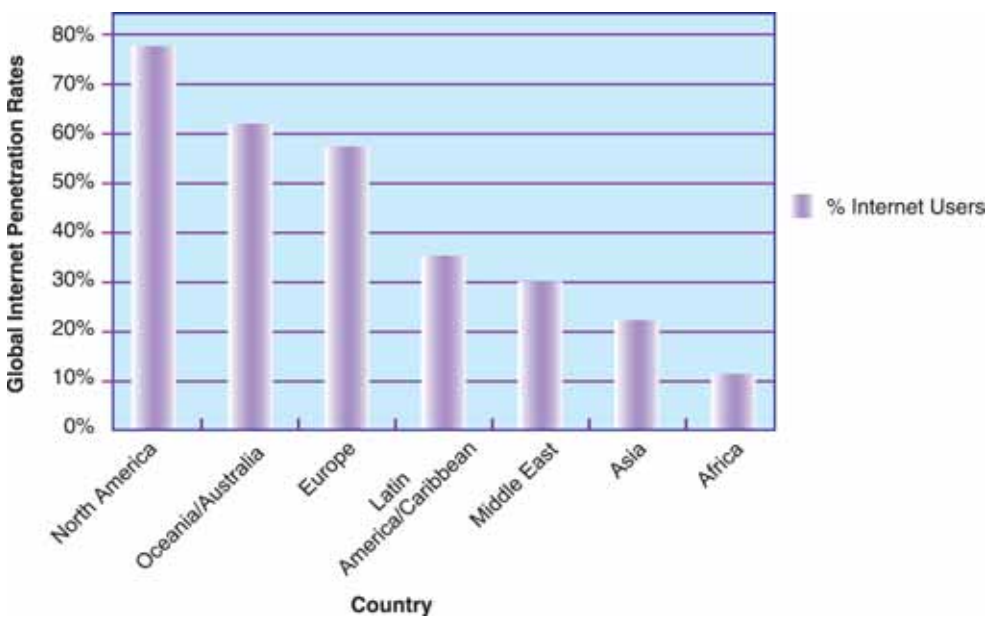
TABLE 15-5 PROBLEMS OF INTERNATIONAL NETWORKS

Quality of service
Security
Costs and tariffs
Network management
Installation delays
Poor quality of international service
Regulatory constraints
Network capacity

information more rapidly with business partners in their supply chains. They can use the public Internet to create global networks using VPNs from Internet service providers, which provide many features of a private network using the public Internet (see Chapter 7). However, VPNs may not provide the same level of quick and predictable response as private networks, especially during times of the day when Internet traffic is very congested, and they may not be able to support large numbers of remote users.

The high cost of PCs, and low incomes, limit access to Internet service in many developing countries (see Figure 15-5). Where an Internet infrastructure exists in less-developed countries, it often lacks bandwidth capacity, and is unreliable in part due to power grid issues. The purchasing power of most people in developing countries makes access to Internet services very expensive in local currencies. In addition, many countries monitor transmis-

FIGURE 15-5 INTERNET PENETRATION BY REGION



The percentage of the total population using the Internet in developing countries is much smaller than in the United States and Europe, but the fastest growth is in Asia.

Source: Internetworldstats.com, 2010.

sions. Governments in China, Singapore, Iran, and Saudi Arabia monitor Internet traffic and block access to Web sites considered morally or politically offensive. On the other hand, the rate of growth in the Internet population is far faster in Asia, Africa, and the Middle East than in North America and Europe, where the Internet population is growing slowly if at all. In 2010, China, for instance, has more than 420 million Internet users compared to the United States with about 221 million. Therefore, in the future, Internet connectivity will be much more widely available and reliable in less-developed regions of the world, and it will play a significant role in integrating these economies with the world economy.

The Interactive Session on Organizations describes how cell phones provide a partial solution to this problem. Their use is mushrooming in developing countries, and they are starting to become engines for economic development.

SOFTWARE LOCALIZATION

The development of core systems poses unique challenges for application software: How will the old systems interface with the new? Entirely new interfaces must be built and tested if old systems are kept in local areas (which is common). These interfaces can be costly and messy to build. If new software must be created, another challenge is to build software that can be realistically used by multiple business units from different countries given that business units are accustomed to their unique business processes and definitions of data.

Aside from integrating the new with the old systems, there are problems of human interface design and functionality of systems. For instance, to be truly useful for enhancing productivity of a global workforce, software interfaces must be easily understood and mastered quickly. Graphical user interfaces are

This page from the Pearson Prentice Hall Web site was translated into Japanese. Web sites and software interfaces for global systems may have to be translated into multiple languages to accommodate users in other parts of the world.

INTERACTIVE SESSION: ORGANIZATIONS

HOW CELL PHONES SUPPORT ECONOMIC DEVELOPMENT

As cell phones, the Internet, high-speed Internet connections, and other information and communication technologies become increasingly widespread, more and more people are experiencing the benefits each technology has to offer. Many of these technologies have not yet closed the "digital divide" separating the world's well-developed and underdeveloped nations. Some countries, like the United States, have access to most new technologies, but most residents of poorer countries still struggle with challenges like obtaining reliable electricity and abject poverty. Recent trends in cell phone design and consumer research indicate that cellular phones are crossing the digital divide and are becoming a truly ubiquitous technology (far more so than personal computers), enhancing the quality of life for millions of people while also increasing the strength of the global economy. As in the United States, by 2015, cell phones will be the primary means of access to the Internet in the developing world.

For instance, mobile phone use in Africa is booming. Despite their high costs (the price of a phone in Niger is equal to five days of income), mobile phone subscriptions in Africa have risen from 16 million in 2000, to 376 million in 2008. Sixty-eight percent of the world's mobile phone subscriptions are in developing countries, compared with 20 percent of the world's Internet users. Because cell phones combine features of watches, alarm clocks, cameras and video cameras, stereos, televisions, and perhaps even wallets soon due to the growing popularity of mobile banking, they are growing in usefulness even as they decrease in price. Most importantly, cell phones are increasingly becoming the most convenient and affordable way to connect to the Internet and perform other tasks traditionally associated with computers. And cell phones are much less costly than personal computers.

The possession of a cell phone greatly increases efficiency and quality of life, so the global economy would stand to benefit on a proportionally large scale. Many economists believe that widespread cell phone usage in developing countries is having a profound and revolutionary effect on their economic well-being in a way that traditional methods of foreign aid have failed to achieve.

Cellular phone companies such as Nokia are sending what they call "human-behavior researchers" or "user anthropologists" to gather as much useful information as they can about consumer habits and the lives of potential cell phone buyers. They pass on that information to cell phone designers and technology architects. This process represents a new approach to designing phones known as "human-centered design". Human-centered design is important to high-tech companies trying to build products that people find appealing and easy to use, and are thus more likely to be bought.

Nokia and other companies face significant challenges in marketing their phones to the poorest segment of Africa and Asia's populations. Barriers include lack of electricity in many areas, incomes too low to afford a cell phone, and potential lack of service in non-urban areas. India currently leads the way in cell phone subscriptions, with an astounding 756 million (63 percent of its total population), but many other countries lag far behind both in cell phone usage and rates of Internet access. For example, Morocco, one of Africa's leaders in cell phone and Internet usage, boasts 20 million Internet users, or 58 percent of its total population. By comparison, the United States. has over 221 million Internet users of all ages, or 79 percent of its total population.

The World Resources Institute published a report detailing how the poor in developing countries allocate their money. Even the poorest families dedicated significant portions of their small budgets to communication technologies such as cell phones. Having a cell phone is a tremendous advantage for members of populations that are constantly on the move due to war, drought, natural disasters, or extreme poverty, primarily because it allows people to remain reachable under practically any circumstances. Cell phones also have implications for medicine in these countries: patients can more easily reach doctors, and doctors can more easily acquire information pertaining to diseases and ailments they may need to treat.

In addition to the benefit of being able to stay in touch with others, cell phones are also useful as a business tool. Evidence suggests that possession of a cell phone increases profits on an individual level,

allowing people to more easily identify and take advantage of business opportunities. A recent study by the Centre for Economic Policy Research also showed that for every additional 10 cellular phones per 100 people a country acquires, that country's gross domestic product (GDP) rises 0.5 percent.

In Niger, millet is a household staple sold in traditional village markets across thousands of square miles. According to economists, the growth of mobile phone coverage reduced grain price differences across markets by 15 percent between 2001 and 2007, with a greater impact on markets isolated by distance and poor-quality roads. Traders could respond to surpluses and shortages in the market, making better decisions about price and delivery. As a result, trader profits rose and prices fell.

Harvard economist Robert Jensen discovered that the introduction of mobile phones in the Indian coastal state of Kerala reduced price differences across fish markets by almost 60 percent between 1997 and 2001, providing an almost-perfect example of the "Law of One Price": when markets work efficiently, identical goods have the same price. In addition, mobile phones almost completely eliminated waste—the catch left unsold at the end of the day—by allowing fishermen to call around to different markets while at sea, choose the market with the best price, and sell accordingly. Mobile phones resulted in financial improvements for both fishermen and consumers: fishermen's profits increased by 8 percent, and consumer prices declined by 4 percent.

Economists and others who believe that poor countries need to radically change their economic structure in order to develop, and who also discourage reliance on international aid given to failing economies, are enthusiastic about the positive impact that cell phones and other information technologies can have on underdeveloped countries. Access to the Internet via cell phones also promises to bring about societal and political change in developing countries in which repressive governments exert control over all forms of media.

Sources: Worldwide Worx, "Businesses Across Africa Are Expecting a Revolution in Internet Access, Technology and Costs as a Result of the Rush of New Undersea Cables Connecting the Continent," Telecom Trends in Africa Report 2010, September 16, 2010; Jenny C. Aker and Isaac M. Mbiti, "Mobile Phones and Economic Development in Africa," Center for Global Development, June 1, 2010; Jenny Aker and Isaac Mbiti, "Africa Calling: Can Mobile Phones Make a Miracle," *Boston Review*, March/April 2010; "Top 20 Countries—Internet Usage," Internetworldstats.com, November 2010.

CASE STUDY QUESTIONS

1. What strategies are cell phone companies using to 'close the digital divide' and market phones to the poorest segment of the world's population?
2. Why do economists predict that widespread cell phone usage in developing countries would have an unprecedented effect on the growth of those countries?
3. What are some examples of how cell phones might increase quality of life for residents of developing countries?
4. Do you believe that cell phones will proliferate widely through Africa and Asia? Why or why not?

MIS IN ACTION

Explore the Web site for One Laptop Per Child (www.laptop.org) and then answer the following questions:

1. What are the capabilities of the XO laptop (especially the latest version, XO-3) ? How well-suited is this machine for developing countries?
2. How would use of the XO laptop narrow the global digital divide? Compare the potential impact of this machine to that of cell phones in developing nations.

ideal for this but presuppose a common language—often English. When international systems involve knowledge workers only, English may be the assumed international standard. But as international systems penetrate deeper into management and clerical groups, a common language may not be assumed and human interfaces must be built to accommodate different languages and even conventions. The entire process of converting software to operate in a second language is called **software localization**.

What are the most important software applications? Many international systems focus on basic transaction and management reporting systems. Increasingly, firms are turning to supply chain management and enterprise systems to standardize their business processes on a global basis and to create coordinated global supply chains. However, these cross-functional systems are not always compatible with differences in languages, cultural heritages, and business processes in other countries (Martinons, 2004; Liang et al., 2004; Davison, 2002). Company units in countries that are not technically sophisticated may also encounter problems trying to manage the technical complexities of enterprise applications.

Electronic Data Interchange (EDI) systems and supply chain management systems are widely used by manufacturing and distribution firms to connect to suppliers on a global basis. Collaboration systems, e-mail, and videoconferencing are especially important worldwide collaboration tools for knowledge- and data-based firms, such as advertising firms, research-based firms in medicine and engineering, and graphics and publishing firms. Internet-based tools will be increasingly employed for such purposes.

15.5 Hands-on MIS Projects

The projects in this section give you hands-on experience analyzing international systems issues for an expanding business, conducting international market research, and building a job posting database and Web page for an international company.

Management Decision Problems

1. United Parcel Service (UPS) has been expanding its package delivery and logistics services in China, serving both multinational companies and local businesses. UPS drivers in China need to use UPS systems and tools such as its handheld Driver Information Acquisition Device for capturing package delivery data. UPS wants to make its WorldShip, CampusShip, and other shipping management services accessible to Chinese and multinational customers via the Web. What are some of the international systems issues UPS must consider in order to operate successfully in China?
2. Your company manufactures and sells tennis rackets and would like to start selling outside the United States. You are in charge of developing a global Web strategy, and the first countries you are thinking of targeting are Brazil, China, Germany, Italy, and Japan. Using the statistics in the CIA World Factbook, which of these countries would you target first? What criteria would you use? What other considerations should you address in your Web strategy? What features would you put on your Web site to attract buyers from the countries you target?

Achieving Operational Excellence: Building a Job Database and Web Page for an International Consulting Firm

Software skills: Database and Web page design
Business skills: Human resources internal job postings

Companies with many overseas locations need a way to inform employees about available job openings in these locations. In this project, you'll use database software to design a database for posting internal job openings and a Web page for displaying this information.

KTP Consulting operates in various locations around the world. KTP specializes in designing, developing, and implementing enterprise systems for medium- to large-size companies. KTP offers its employees opportunities to travel, live, and work in various locations throughout the United States, Europe, and Asia. The firm's human resources department has a simple database that enables its staff to track job vacancies. When an employee is interested in relocating, he or she contacts the human resources department for a list of KTP job vacancies. KTP also posts its employment opportunities on the company Web site.

What type of data should be included in the KTP job vacancies database? What information should not be included in this database? Based on your answers to these questions, build a job vacancies database for KTP. Populate the database with at least 20 records. You should also build a simple Web page that incorporates job vacancy data from your newly created database. Send a copy of the KTP database and Web page to your professor.

Improving Decision Making: Conducting International Marketing and Pricing Research

Software skills: Internet-based software
Business skills: International pricing and marketing

When companies sell overseas, it's important to determine whether their products are priced properly for non-domestic markets. In this project, you'll use the Web to research overseas distributors and customs regulations and use Internet-based software to calculate prices in foreign currencies.

You are in charge of marketing for a U.S. manufacturer of office furniture that has decided to enter the international market. You have been given the name of Sorin SRL, a major Italian office furniture retailer, but your source had no other information. You want to test the market by contacting this firm to offer it a specific desk chair that you have to sell at about $125. Using the Web, locate the information needed to contact this firm and to find out how many European euros you would need to get for the chair in the current market. One source for locating European companies is the Europages Business Directory (www.europages.com). In addition, consider using the Universal Currency Converter Web site (www.xe.net/ucc/), which determines the value of one currency expressed in other currencies. Obtain both the information needed to contact the firm and the price of your chair in their local currency. Then locate and obtain customs and legal restrictions on the products you will export from the United States and import into Italy. Finally, locate a company that will represent you as a customs agent and gather information on shipping costs.

Review Summary

1. *What major factors are driving the internationalization of business?*

   The growth of inexpensive international communication and transportation has created a world culture with stable expectations or norms. Political stability and a growing global knowledge base that is widely shared also contribute to the world culture. These general factors create the conditions for global markets, global production, coordination, distribution, and global economies of scale.

2. *What are the alternative strategies for developing global businesses?*

   There are four basic international strategies: domestic exporter, multinational, franchiser, and transnational. In a transnational strategy, all factors of production are coordinated on a global scale. However, the choice of strategy is a function of the type of business and product.

3. *How can information systems support different global business strategies?*

   There is a connection between firm strategy and information systems design. Transnational firms must develop networked system configurations and permit considerable decentralization of development and operations. Franchisers almost always duplicate systems across many countries and use centralized financial controls. Multinationals typically rely on decentralized independence among foreign units with some movement toward development of networks. Domestic exporters typically are centralized in domestic headquarters with some decentralized operations permitted.

4. *What are the challenges posed by global information systems and management solutions for these challenges?*

   Global information systems pose challenges because cultural, political, and language diversity magnifies differences in organizational culture and business processes and encourages proliferation of disparate local information systems that are difficult to integrate. Typically, international systems have evolved without a conscious plan. The remedy is to define a small subset of core business processes and focus on building systems to support these processes. Tactically, managers will have to coopt widely dispersed foreign units to participate in the development and operation of these systems, being careful to maintain overall control.

5. *What are the issues and technical alternatives to be considered when developing international information systems?*

   Implementing a global system requires an implementation strategy that considers both business design and technology platforms. The main hardware and telecommunications issues are systems integration and connectivity. The choices for integration are to go either with a proprietary architecture or with open systems technology. Global networks are extremely difficult to build and operate. Firms can build their own global networks or they can create global networks based on the Internet (intranets or virtual private networks). The main software issues concern building interfaces to existing systems and selecting applications that can work with multiple cultural, language, and organizational frameworks.

Key Terms

Business driver, 586
Cooptation, 598
Core systems, 596
Domestic exporter, 591
Franchisers, 591
Global culture, 587
International information systems architecture, 586
Legitimacy, 598
Multinational, 591
Particularism, 589
Software localization, 605
Transborder data flow, 589
Transnational, 592

Review Questions

1. What major factors are driving the internationalization of business?
   - List and describe the five major dimensions for developing an international information systems architecture.
   - Describe the five general cultural factors leading toward growth in global business and the four specific business factors. Describe the interconnection among these factors.
   - List and describe the major challenges to the development of global systems.
   - Explain why some firms have not planned for the development of international systems.
2. What are the alternative strategies for developing global businesses?
   - Describe the four main strategies for global business and organizational structure.
3. How can information systems support different global business strategies?
   - Describe the four different system configurations that can be used to support different global strategies.
4. What are the challenges posed by global information systems and management solutions for these challenges?
   - List and describe the major management issues in developing international systems.
   - Identify and describe three principles to follow when organizing the firm for global business.
   - Identify and describe three steps of a management strategy for developing and implementing global systems.
   - Define cooptation and explain how can it be used in building global systems.
5. What are the issues and technical alternatives to be considered when developing international information systems?
   - Describe the main technical issues facing global systems.
   - Identify some technologies that will help firms develop global systems.

Discussion Questions

1. If you were a manager in a company that operates in many countries, what criteria would you use to determine whether an application should be developed as a global application or as a local application?
2. Describe ways the Internet can be used in international information systems.

Video Cases

You will find Video Cases illustrating some of the concepts in this chapter on the Laudon Web site along with questions to help you analyze the cases.

Collaboration and Teamwork: Identifying Technologies for Global Business Strategies

With a group of students, identify an area of information technology and explore how this technology might be useful for supporting global business strategies. For instance, you might choose an area such as digital telecommunications (e.g., e-mail, wireless communications, virtual private networks), enterprise systems, collaboration software, or the Web. It will be necessary to choose a business scenario to discuss the technology. You might choose an automobile parts franchise or a clothing franchise, such as Express, as example businesses. Which applications would you make global, which core business processes would you choose, and how would the technology be helpful? If possible, use Google Sites to post links to Web pages, team communication announcements, and work assignments; to brainstorm; and to work collaboratively on project documents. Try to use Google Docs to develop a presentation of your findings for the class.

WR Grace Consolidates its General Ledger System

CASE STUDY

WR Grace is a chemical manufacturer headquartered in Columbia, Maryland. Founded in 1854, the company develops and sells specialty chemicals and construction products and has been a worldwide leader in those fields. Grace has over 6,300 employees and earned $2.8 billion in revenues in 2009. The company has two operating segments: Grace Davison, which focuses on specialty chemicals and formulation technologies, and Grace Construction Products, which focuses on specialty construction materials, systems, and services. Between these two divisions, there are over 200 separate subsidiaries and several different legal entities that comprise the full company. Grace has operations in 45 countries around the world.

Though Grace is a strong and successful company, global companies with separate divisions often struggle to unify their information systems. Grace is not a single, cohesive business unit—it's an amalgam of many operating divisions, subsidiaries, and business units, all of which use different financial data, reports, and reconciliation methods. Though this "fractured" structure is common to most global companies, it created problems for the company's general ledger. The general ledger of a business is its main accounting record. General ledgers use double-entry bookkeeping, which means that all of the transactions made by a company are entered into two different accounts, debits and credits. General ledgers include accounts for current assets, fixed assets, liabilities, revenues and expense items, gains, and losses.

It's no surprise that a global company that earns several billion dollars in revenues would have a complicated ledger system, but Grace's general ledger setup was more than just complicated. It was a disorganized tangle of multiple ledgers, redundant data, and inefficiency processes. The company had three separate ledger systems from SAP: one for its legal reporting requirements team, and two more for each of its two major operating segments, Grace Davison and Grace Construction Products. But each of the three implementations for these systems occurred several years apart, so the differences between the ledgers were substantial. All three ledgers had different configurations and different levels of granularity within the reporting functionality, and all three of the ledgers were driven by separate data sources.

The "classic" general ledger is used for reporting revenues and expenditures for all subsidiaries, accounts, and business areas. The Grace Davison ledger stored information on company codes (subsidiary ID numbers), accounts, profit centers, plants, and trading partners. The Grace Construction Products management ledger stored information on company codes, accounts, business areas, profit centers, trading partners, and destination countries. Grace Davison used profit-center accounting for its management reporting, and Grace Construction Products used special-purpose ledgers to gather the same financial information. If this sounds like a confusing arrangement, that's because it was.

Consolidating this data across the two divisions and across its many subdivisions proved difficult, and compiling company financial reports was a painstaking and time-consuming task. Reconciling the financial data from each of the three reporting sources resulted in lengthy financial close cycles and consumed excessive amounts of employee time and resources. Michael Brown, director of finance productivity at Grace, said that "from a financials point of view, we were basically three different companies." Grace management decided that the company needed to eliminate the financial reporting 'silos' and create a system that served all parts of Grace's business.

WR Grace hoped to create a global financial standard for its financial reporting system, using the slogan "one Grace" to rally the company to work towards that standard. SAP General Ledger was the most important factor in Grace's ability to accomplish its goal. SAP General Ledger was attractive to Grace because of its many unique and useful features. It has the ability to automatically and simultaneously post all sub-ledger items in the appropriate general accounts, simultaneously update general ledger and cost accounting areas, and evaluate and report on current accounting data in real time. Grace also liked SAP's centralized approach to general ledger, up-to-date references for the rendering of accounts across all of its divisions.

Consolidating multiple ledgers is a difficult task. SAP General Ledger helped Grace to simplify the

process. SAP Consulting and an SAP General Ledger migration team assisted the company along the way. SAP implementations feature an SAP team leader and project manager as well as a migration cockpit. The migration cockpit is a feature of SAP implementations that offers a graphical representation and overview of the general ledger migration process. The cockpit displays steps of the migration in sequence and manages logs, attachments, and other materials important to the general ledger. The migration cockpit helps to ensure that sufficient planning goes into the general ledger consolidation process, and that the necessary business process changes accompany the technical changes of implementing a unified general ledger.

SAP and Grace split the project into two main components: General Ledger Data Migration, and Business Process Testing. General Ledger Data Migration involved acquiring all of the relevant data from Grace's three separate ledgers, combining it and eliminating redundancies, and supplying it to the SAP General Ledger. A small team executed this half of the project. Grace decided to standardize its reporting processes around profit-center accounting and built its general ledger design with that standard in mind. Business Process Testing was completed by a global SAP team performing multiple full-cycle tests. In other words, SAP testers accessed the system remotely and tested all of the functions of SAP General Ledger to ensure that the system would work as planned. The SAP General Ledger project manager oversaw both components of the project.

During the testing process, SAP testers used a technique called "unit testing," common to many system upgrades of this type. The testers set up a "dummy" system with a prototype version of the general ledger and used it to test different types of accounting documents. Grace wanted to modify the configuration of the general ledger to conform to the company's unique needs and circumstances, and made sure that the people who knew what was needed were building the system and designing its specifications. Because of these adjustments, unit testing was critical to ensure that configuration changes had not affected the overall integrity of the system.

SAP testers also performed basic scenario tests, complex scenario tests, and tests on special accounting document types in an effort to ensure that the general ledger was equipped to handle all of the tasks Grace expected it to perform. They also tested inbound finance interfaces, such as the HR interface, bank statements, and upload programs, as well as special document types used by those interfaces. SAP and Grace both knew that a significant effort would be required to properly test the general ledger, and SAP's experience with similar upgrades in the past was helpful in ensuring that SAP performed the proper amount of tests.

After the data migration was completed, Grace still had to decommission its old ledgers, which were still pivotal sources for many of the custom reports that the company was generating on a regular basis. For example, reports are automatically generated from the special-purpose ledger, or reports that group all the transactions that took place within a particular country in the past year, and so on. To decommission its old ledgers, Grace had to eliminate as many of those custom reports as it could, and move the essential ones over to the new general ledger. Grace recruited employees from all areas of their financial division to identify the most critical reports.

With the general ledger migration completed, all of WR Grace shares a common accounting infrastructure, management can quickly develop an overall picture of the company's financial status, and most of the ledger can be accessed or updated in real time. The financial reconciliation processes at the end of each reporting period were totally eliminated, allowing Grace to devote less energy on managing its ledgers and more on actually running its business. The eventual savings in all areas of the business figure to pay for the installation in short order. Grace's accountants and financial planners will be much more efficient. Managers will spend less time getting the information they need. IT costs for maintaining a single ledger will total far less than the costs for maintaining three, and fewer errors will make their way into the general ledger system. Best of all for Grace, the implementation was completed on time and under budget.

Grace hopes to use the General Ledger platform to continue making other improvements with SAP. Grace plans to upgrade its consolidation systems, financial planning, and analytics functions to SAP systems. Grace already had a strong relationship with SAP. In 1997, Grace installed SAP software for the first time, and prior to the general ledger migration, Grace was already using SAP Business Information Warehouse and NetWeaver Portal globally. This pre-existing relationship made the process of implementing SAP General Ledger much easier. It's also the reason why Grace is so optimistic that it will achieve similar gains in other areas of its business by switching to SAP solutions.

Sources: Christ Maxcer, "Global Enterprise Unites as One: W.R. Grace Migrates to SAP General Ledger," insiderPROFILES 5, no. 1, January 2, 2009; SAP AG, "One Grace Project Builds Single Source of Truth Using SAP General Ledger," 2008; and Ed Taylor, "The Business Benefits of a General Ledger Migration at W.R. Grace & Co." May 6, 2008.

CASE STUDY QUESTIONS

1. Why did WR Grace's general ledger system need an overhaul?
2. What made SAP a logical partner for Grace's upgrade?
3. What obstacles did SAP and Grace face in their attempts to consolidate Grace's ledgers?
4. How successful was the general ledger migration? What are some of the risks of adopting a single general ledger system from a single vendor to run a global business?