mational needs of the entire organization. The approach begins by conducting an extensive analysis of the organization's mission, objectives, and strategy and determining the information requirements needed to meet each objective. This approach to ISP implies by its name a high-level organizational perspective with active involvement of top-level management. The top-down approach to ISP has several advantages over other planning approaches, which are summarized in Table 4-4.

In contrast to the top-down planning approach, a **bottom-up planning** approach requires the identification of business problems and opportunities that are used to define projects. Using the bottom-up approach for creating IS plans can be faster and less costly than using the top-down approach and also has the advantage of identifying pressing organizational problems. Yet, the

**TABLE 4-4 Advantages to the Top-Down Planning Approach Over Other Planning Approaches**

<table>
<thead>
<tr>
<th>Advantage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broader Perspective</td>
<td>If not viewed from the top, information systems may be implemented without first understanding the business from general management’s viewpoint.</td>
</tr>
<tr>
<td>Improved Integration</td>
<td>If not viewed from the top, totally new management information systems may be implemented rather than planning how to evolve existing systems.</td>
</tr>
<tr>
<td>Improved Management Support</td>
<td>If not viewed from the top, planners may lack sufficient management acceptance of the role of information systems in helping them achieve business objectives.</td>
</tr>
<tr>
<td>Better Understanding</td>
<td>If not viewed from the top, planners may lack the understanding necessary to implement information systems across the entire business rather than simply to individual operating units.</td>
</tr>
</tbody>
</table>

(Source: IBM, 1982; pp. 236–37.)

**Bottom-up planning**: A generic information systems planning methodology that identifies and defines IS development projects based upon solving operational business problems or taking advantage of some business opportunities.
bottom-up approach often fails to view the informational needs of the entire organization. This can result in the creation of disparate information systems and databases that are redundant or not easily integrated without substantial rework.

The process of describing the current situation begins by selecting a planning team that includes executives chartered to model the existing situation. To gain this understanding, the team will need to review corporate documents, interview managers, executives, and customers; and conduct detailed reviews of competitors, markets, products, and finances. The type of information that must be collected to represent the current situation includes the identification of all organizational locations, units, functions, processes, data (or data entities), and information systems.

Within Pine Valley Furniture, for example, organizational locations would consist of a list of all geographic areas in which the organization operates (e.g., the locations of the home and branch offices). Organizational units represent a list of people or business units that operate within the organization. Thus, organizational units would include vice president of manufacturing, sales manager, salesperson, and clerk. Functions are cross-organizational collections of activities used to perform day-to-day business operations. Examples of business functions might include research and development, employee development, purchasing, and sales. Processes represent a list of manual or automated procedures designed to support business functions. Examples of business processes might include payroll processing, customer billing, and product shipping. Data entities represent a list of the information items generated, updated, deleted, or used within business processes. Information systems represent automated and nonautomated systems used to transform data into information to support business processes. For example, Figure 4-11 shows portions of the business functions, data entities, and information systems of PVF. Once high-level information is collected, each item can typically be decomposed into smaller units as more detailed planning is performed. Figure 4-12 shows the decomposition of several of PVF’s high-level business functions into more detailed supporting functions.

After creating these lists, a series of matrices can be developed to cross-reference various elements of the organization. The types of matrices typically developed include the following:

- Location-to-Function: This matrix identifies which business functions are being performed at various organizational locations.
- Location-to-Unit: This matrix identifies which organizational units are located in or interact with a specific business location.
- Unit-to-Function: This matrix identifies the relationships between organizational entities and each business function.
- Function-to-Objective: This matrix identifies which functions are essential or desirable in achieving each organizational objective.
- Function-to-Process: This matrix identifies which processes are used to support each business function.
- Function-to-Data Entity: This matrix identifies which business functions utilize which data entities.
- Process-to-Data Entity: This matrix identifies which data are captured, used, updated, or deleted within each process.
- Process-to-Information System: This matrix identifies which information systems are used to support each process.
- Data Entity-to-Information System: This matrix identifies which data are created, updated, accessed, or deleted in each system.
- Information System-to-Objective: This matrix identifies which information systems support each business objective as identified during organizational planning.

Different matrices will have different relationships depending on what is being represented. For example, Figure 4-13 shows a portion of the Data

![Image of a diagram showing functional decomposition of information systems planning information (Pine Valley Furniture)]
**Figure 4-13**
Data Entity-to-Function matrix (Pine Valley Furniture)

Entity-to-Function matrix for Pine Valley Furniture. The “X” in various cells of the matrix represents which business functions utilize which data entities. A more detailed picture of data utilization would be shown in the Process-to-Data Entity matrix (not shown here), in which the cells would be coded as “C” for the associated process that creates or captures data for the associated data entity, “R” for retrieve (or used), “U” for update, and “D” for delete. This means that different matrices can have different relationships depending on what is being represented. Because of this flexibility and ease of representing information, analysts use a broad range of matrices to gain a clear understanding of an organization’s current situation and to plan for its future (Kerr, 1990). A primer on using matrices for information systems planning is provided in Figure 4-14.

2. **Describing the target situation, trends, and constraints.** After describing the current situation, the next step in the ISP process is to define the target situation that reflects the desired future state of the organization. This means that the target situation consists of the desired state of the locations, units, functions, processes, data, and information systems (see Figure 4-9). For example, if a desired future state of the organization is to have several new branch offices or a new product line that requires several new employee positions, functions, processes, and data, then most lists and matrices will need to be updated to reflect this vision. The target situation must be developed in light of technology and business trends, in addition to organizational constraints. This means that lists of business trends and constraints should also be constructed in order to help ensure that the target situation reflects these issues.

In summary, to create the target situation, planners must first edit their initial lists and record the desired locations, units, functions, processes, data, and information systems within the constraints and trends of the organization environment (e.g., time, resources, technological evolution, competition, and so on). Next, matrices are updated to relate information in a manner consistent with the desired future state. Planners then focus on the differences between the current and future lists and matrices to identify projects and transition strategies.
During the information systems planning process, before individual projects are identified and selected, a great deal of "behind the scenes" analysis takes place. During this planning period, which can span from six months to a year, IS planning team members develop and analyze numerous matrices like those described in the associated text. Matrices are developed to represent the current and the future views of the organization. Matrices of the "current" situation are called "as is" matrices. In other words, they describe the world "as it currently is." Matrices of the target or "future" situation are called "to be" matrices. Contrasting the current and future views provides insights into the relationships existing in important business information, and most importantly, forms the basis for the identification and selection of specific development projects. Many CASE tools provide features that will help you make sense out of these matrices in at least three ways:

1. **Management of Information.** A big part of working with complex matrices is managing the information. Using the dictionary features of the CASE tool repository, terms (such as business functions and process and data entities) can be defined or modified in a single location. All planners will therefore have the most recent information.

2. **Matrix Construction.** The reporting system within the CASE repository allows matrix reports to be easily produced. Since planning information can be changed at any time by many team members, an easy method to record changes and produce the most up-to-date reports is invaluable to the planning process.

3. **Matrix Analysis.** Possibly the most important feature CASE tools provide to planners is the ability to perform complex analyses within and across matrices. This analysis is often referred to as **affinity clustering.** Affinity refers to the extent to which information holds things in common. Thus, affinity clustering is the process of arranging matrix information so that clusters of information with some predetermined level or type of affinity are placed next to each other on a matrix report. For example, an affinity clustering of a Process-to-Data Entry matrix would create roughly a block diagonal matrix with processes that use similar data entities appearing in adjacent rows and data entities used in common by the same processes grouped into adjacent columns. This general form of analysis can be used by planners to identify items that often appear together (or should!). Such information can be used by planners to most effectively group and relate information (e.g., data to processes, functions to locations, and so on). For example, those data entities used by a common set of processes are candidates for a specific database. And those business processes that relate to a strategically important objective will likely receive more attention when managers from those areas request system changes.

**Figure 4-14**

Making sense out of planning matrices

**Affinity clustering:** The process of arranging planning matrix information so the clusters of information with some predetermined level or type of affinity are placed next to each other on a matrix report.

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3. **Developing a transition strategy and plans.** Once the creation of the current and target situations is complete, a detailed transition strategy and plan are developed by the IS planning team. This plan should be very comprehensive, reflecting broad, long-range issues in addition to providing sufficient detail to guide all levels of management concerning what needs doing, how, when, and by whom in the organization. The components of a typical information systems plan are outlined in Figure 4-15.

The IS plan is typically a very comprehensive document that looks at both short- and long-term organizational development needs. The short- and long-term developmental needs identified in the plan are typically expressed as a series of projects (see Figure 4-16). Projects from the long-term plan tend to build a foundation for later projects (such as transforming databases from old technology into newer technology). Projects from the short-term plan consist of specific steps to fill the gap between current and desired systems or respond to dynamic business conditions. The top-down (or plan-driven) projects join a set of bottom-up or needs-driven projects submitted as system service requests from managers to form the short-term systems development
CHAPTER 4  IDENTIFYING AND SELECTING SYSTEMS DEVELOPMENT PROJECTS

I. Organizational Mission, Objectives, and Strategy
Briefly describes the mission, objectives, and strategy of the organization. The current and future views of the company are also briefly presented (i.e., where we are, where we want to be).

II. Informational Inventory
This section provides a summary of the various business processes, functions, data entities, and information needs of the enterprise. This inventory will view both current and future needs.

III. Mission and Objectives of Information Systems
Description of the primary role IS will play in the organization to transform the enterprise from its current to future state. While it may later be revised, it represents the current best estimate of the overall role for IS within the organization. This role may be as a necessary cost, an investment, or a strategic advantage, for example.

IV. Constraints on IS Development
Briefly describes limitations imposed by technology and current level of resources within the company—financial, technological, and personnel.

V. Overall Systems Needs and Long-Range IS Strategies
Presents a summary of the overall systems needed within the company and the set of long-range (2–5 years) strategies chosen by the IS department to fill the needs.

VI. The Short-Term Plan
Shows a detailed inventory of present projects and systems and a detailed plan of projects to be developed or advanced during the current year. These projects may be the result of the long-range IS strategies or of requests from managers that have already been approved and are in some stage of the life cycle.

VII. Conclusions
Contains likely but not-yet-certain events that may affect the plan, an inventory of business change elements as presently known, and a description of their estimated impact on the plan.

Figure 4-15
Outline of an information systems plan

Figure 4-16
Systems development projects flow from the information systems plan

Collectively, the short- and long-term projects set clear directions for the project selection process. The short-term plan includes not only those projects identified from the planning process but also those selected from among bottom-up requests. The overall IS plan may also influence all development projects. For example, the IS mission and IS constraints may cause projects to choose certain technologies or emphasize certain application features as systems are designed.

In this section, we outlined a general process for developing an IS plan. ISP is a detailed process and an integral part of deciding how to best deploy information systems and technologies to help reach organizational goals. It is beyond the scope of this chapter, however, to extensively discuss ISP, yet it should be clear from our discussion that planning-based project identification and selection will yield substantial benefits to an organization. It is probably also clear to you that, as a systems analyst, you are not usually involved in IS planning, because this process requires senior IS and corporate management participation. On the other hand, the results of IS planning, such as planning
Identifying and selecting systems development projects for an Internet-based electronic commerce application is no different from the process followed for more traditional applications. Nonetheless, there are some special considerations when developing an Internet-based application. In this section, we highlight some of those issues that relate directly to the process of identifying and selecting Internet-related systems development projects.

Internet Basics

The name Internet is derived from the concept of “internetworking,” that is, connecting host computers and their networks to form an even larger, global network. And that is essentially what the Internet is—a large, worldwide network of networks that use a common protocol to communicate with each other. The interconnected networks include Windows, UNIX, IBM, Novell, Apple, Linux, and many other network and computer types. The Internet stands as the most prominent representation of global networking. Using the Internet to support day-to-day business activities is broadly referred to as electronic commerce (EC). However, not all Internet EC applications are the same. For example, there are three general classes of Internet EC applications: Internet, intranet, and extranet. Figure 4-17 shows three possible modes of EC using the Internet. The term used to describe transactions between individuals and businesses is Internet-based EC. So, the term Internet is used to refer to both the global computing network and to business-to-consumer (B2C) EC applications. Intranet refers to the use of the Internet within the same business, and extranet refers to the use of the Internet between firms. Extranet EC is commonly referred to as “B2B” because it is business-to-business EC.

Intranets and extranets are examples of two ways organizations have been communicating via technology for years. For example, intranets are a lot like having a “global” local area network (LAN). Organizations with intranets dictate what applications will run over the intranet—such as e-mail or an inventory-control system—as well as dictate the speed and quality of the hardware connected to the intranet. In other words, intranets are a new twist—a global twist—to an old way of using information systems to support business activities within a single organization. Likewise, extranets are also similar to an established computing model, electronic data interchange (EDI). EDI refers to the use of telecommunications technologies to directly transfer business documents between organizations. Using EDI, trading partners (suppliers, manufacturers, customers, etc.) establish computer-to-computer links.
that allow them to exchange data electronically. For example, a company using EDI may send an electronic purchase order instead of a paper request to a supplier. The paper order may take several days to arrive at the supplier, whereas an EDI purchase order will only take a few seconds. EDI is fast becoming the standard by which organizations will communicate with each other in the world of electronic commerce.

When developing either an intranet or an extranet, developers know who the users are, what applications will be used, the speed of the network connection, and the type of communication devices supported (e.g., Web browsers such as Internet Explorer, mobile devices such as a Palm Pilot, or Web-enabled cellular phone such as the Motorola Q). On the other hand, when developing an Internet EC application (hereafter, simply EC), there are countless unknowns that developers have to discern in order to build a useful system. Table 4-5 lists a sample of the numerous unknowns to be dealt with when designing and building an EC application. These unknowns may result in making trade-offs based on a careful analysis of who the users are likely to be, where they are likely to be located, and how they are likely to be connected to the Internet. Even with all these difficulties to contend with, there is no shortage of Internet EC applications springing up all across the world. One company that has decided to get onto the Web with its own EC site is Pine Valley Furniture.

### Pine Valley Furniture WebStore

The board of directors of PVF has requested that a project team be created to explore the opportunity to develop an EC system. Specifically, market research has found that there is a good opportunity for online furniture purchases, especially in the areas of:

- Corporate furniture
- Home office furniture
- Student furniture

The board wants to incorporate all three target markets into its long-term EC plan, but wants to initially focus on the corporate furniture buying system. Board members feel that this segment has the greatest potential to provide an adequate return on investment and would be a good building block for moving into the customer-based markets. Because the corporate furniture buying system will be specifically targeted to the business furniture market, it will be easier to define the system’s operational requirements. Additionally, this EC system should integrate nicely with two currently existing systems, Purchasing Fulfillment and Customer Tracking. Together, these attributes make it an ideal candidate for initiating PVF’s Web strategy. Throughout the remainder of the book, we will follow the evolution of the WebStore project until it becomes operational for PVF.
In this chapter, we described the first major activity of the planning phase of the SDLC—project identification and selection. Project identification and selection consists of three primary activities: identifying potential development projects, classifying and ranking projects, and selecting projects for development. A variety of organizational members or units can be assigned to perform this process, including top management, a diverse steering committee, business units and functional managers, the development group, or the most senior IS executive. Potential projects can be evaluated and selected using a broad range of criteria such as value chain analysis, alignment with business strategy, potential benefits, resource availability and requirements, and risks.

The quality of the project identification and selection process can be improved if decisions are guided by corporate strategic planning and information systems planning. Corporate strategic planning is the process of identifying the mission, objectives, and strategies of an organization. Crucial in this process is selecting a competitive strategy that states how the organization plans to achieve its objectives.

Information systems planning is an orderly means for assessing the information needs of an organization and defining the systems and databases that will best satisfy those needs. ISP is a top-down process that takes into account outside forces that drive the business and the factors critical to the success of the firm. ISP evaluates the current inventory of systems and the desired future state of the organization and its system, and determines which projects are needed to transform systems to meet the future needs of the organization.

Corporate and IS planning are highly interrelated. Conceptually, these relationships can be viewed via various matrices that show how organizational objectives, locations, units, functions, processes, data entities, and systems relate to one another. Selected projects will be those viewed to be most important in supporting the organizational strategy.

The Internet is a global network consisting of thousands of interconnected individual networks that communicate with each other using a common protocol. Electronic commerce (EC) refers to the use of the Internet to support day-to-day business activities. Internet-based EC refers to transactions between individuals and businesses. Intranet refers to the use of the Internet within the same organization. Extranet refers to the use of the Internet between firms.

The focus of this chapter was to provide you with a clearer understanding of how organizations identify and select projects. Improved project identification and selection is needed for the following reasons: The cost of information systems is rising rapidly, systems cannot handle applications that cross organizational boundaries, systems often do not address critical organizational objectives, data redundancy is often out of control, and system maintenance costs continue to rise. Thus, effective project identification and selection is essential if organizations are to realize the greatest benefits from information systems.
CHAPTER 4 IDENTIFYING AND SELECTING SYSTEMS DEVELOPMENT PROJECTS

A generic information systems planning methodology that attempts to gain a broad understanding of the information system needs of the entire organization.

A generic information systems planning methodology that identifies and defines IS development projects based upon solving operational business problems or taking advantage of some business opportunities.

The process of arranging planning matrix information so the clusters of information with some predetermined level or type of affinity are placed next to each other on a matrix report.

**Review Questions**

1. Contrast the following terms:
   a. Mission; objective statements; competitive strategy
   b. Corporate strategic planning; information systems planning
   c. Top-down planning; bottom-up planning
   d. Low-cost producer; product differentiation; product focus or niche
   e. Data entity; information system

2. Describe the project identification and selection process.

3. Describe several project evaluation criteria.

4. Describe value chain analysis and how organizations use this technique to evaluate and compare projects.

5. Discuss several factors that provide evidence for the need for improved information systems planning today.

6. Describe the steps involved in corporate strategic planning.

7. What are three generic competitive strategies?

8. Describe what is meant by information systems planning and the steps involved in the process.

9. List and describe the advantages of top-down planning over other planning approaches.

10. Briefly describe nine planning matrices that are used in information systems planning and project identification and selection.

11. Discuss some of the factors that must be considered when designing and building Internet applications.

**Problems and Exercises**

1. Write a mission statement for a business that you would like to start. The mission statement should state the area of business you will be in and what aspect of the business you value highly.

2. When you are happy with the mission statement you have developed in response to the prior question, describe the objectives and competitive strategy for achieving that mission.

3. Consider an organization that you believe does not conduct adequate strategic IS planning. List at least six reasons why this type of planning is not done appropriately (or is not done at all). Are these reasons justifiable? What are the implications of this inadequate strategic IS planning? What limits, problems, weaknesses, and barriers might this present?

4. IS planning, as depicted in this chapter, is highly related to corporate strategic planning. What might those responsible for IS planning have to do if they operate in an organization without a formal corporate planning process?

5. The economic analysis carried out during the project identification and selection phase of the systems development life cycle is rather cursory. Why is this? Consequently, what factors do you think tend to be most important for a potential project to survive this first phase of the life cycle?

6. In those organizations that do an excellent job of IS planning, why might projects identified from a bottom-up process still find their way into the project initiation and planning phase of the life cycle?

7. Figure 4-14 introduces the concept of affinity clustering. Suppose that through affinity clustering it was found that three business functions provided the bulk of the use of five data entities. What implications might this have for project identification and subsequent steps in the systems development life cycle?

8. Timberline Technology manufactures membrane circuits in its Northern California plant. In addition, all circuit design and R&D work occur at this site. All finance, accounting, and human resource functions are headquartered at the parent company in the upper Midwest. Sales take place through six sales representatives located in various cities across the country. Information systems for payroll processing, accounts payable, and accounts receivable are located at the parent office while systems for inventory management and computer-integrated manufacturing are at the California plant. As best you can, list the locations, units, functions, processes, data entities, and information systems for this company.