BCA Third Semester

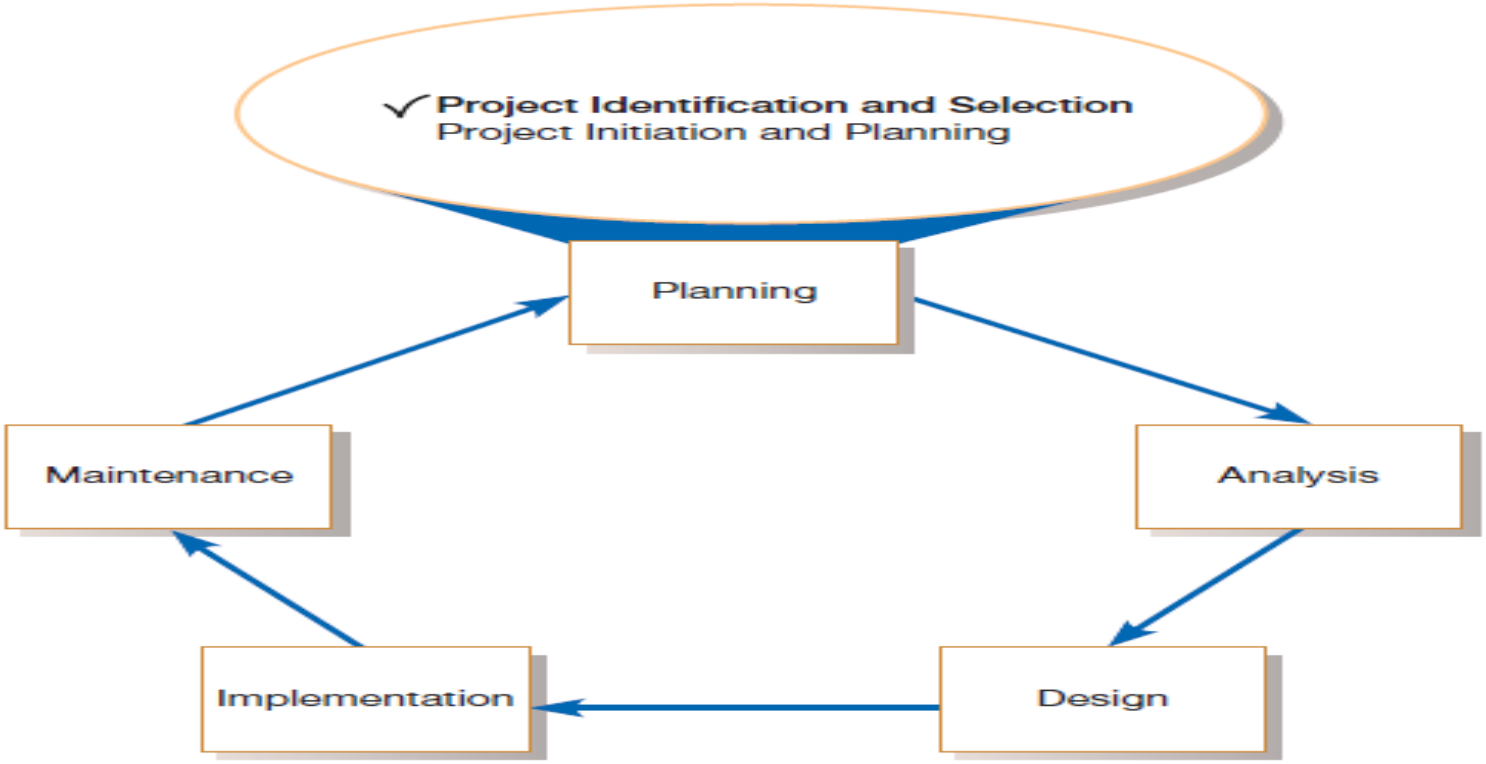
System Analysis and Design

Chapter-2

UNIT-TWO

IDENTIFICATION AND SELECTION OF SYSTEM DEVELOPMENT PROJECTS

- The first phase of the SDLC is planning, consisting of project identification and selection, and project initiation and planning (see Figure 4-1).
- During project identification and selection, a senior manager, a business group, an IS manager, or a steering committee identifies and assesses all possible systems development projects that an organization unit could undertake.
- Next, those projects deemed most likely to yield significant organizational benefits, given available resources, are selected for subsequent development activities. In some organizations, project identification and selection is a very formal process in which projects are outcomes of a larger overall planning process.
- For example, a large organization may follow a formal project identification process whereby a proposed project is **rigorously (**extremely strictly **) compared** with all competing projects.
- **Alternatively, a small organization** may use informal project selection processes that allow the highest-ranking IS manager to independently select projects or allow individual business units to decide on projects after agreeing to provide project funding.



Figur4-1

Systems development life cycle with and selection highlighted[3]

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- Information systems development requests come from a variety of sources.
  - **One source is** requests by managers and business units for replacing or extending an existing system to gain needed information or to provide a new service to customers.
  - **Another source for requests is** IS managers who want to make a system more efficient and less costly to operate, or want to move it to a new operating environment.
  - **A final source of projects** is a formal planning group that identifies projects for improvement to help the organization meet its corporate objectives (e.g. a new system to provide better customer service).
- Regardless of how a given organization actually executes the project identification and selection process, a common sequence of activities occurs.
- In the following sections, we describe a general process for identifying and selecting projects and producing the deliverables and outcomes of this process.

The Process of Identifying and Selecting IS Development Projects

- Project identification and selection consists of three primary activities:

  1.Identifying potential development projects

  2.Classifying and ranking IS development projects

  3.Selecting IS development projects

1. **Identifying potential development projects**.

- Organizations vary as to how they identify projects.
- This process can be performed by a key member of top management, either the CEO of a small- or medium sized organization or a senior executive in a larger organization; a steering committee, composed of a cross section of managers with an interest in systems; user departments, in which either the head of the requesting unit or a committee from the requesting department decides which projects to submit (often you, as a systems analyst, will help users prepare such requests); or the development group or a senior IS manager.

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- All methods of identification have been found to have strengths and weaknesses. Research has found, for example, that **projects identified by top management** more often have a strategic organizational focus.
- Alternatively, projects identified by **steering committees** more often reflect the diversity of the committee and therefore have a cross- functional focus.
- **Projects identified by individual departments or business units** most often have a narrow, tactical focus.
- Finally, a dominant characteristic of projects identified by the development group is the ease with which existing hardware and systems will integrate with the proposed project.
- Other factors, such as **project cost**, **duration**, **complexity**, and **risk**, are also influenced by the source of a given project.
- Characteristics of each selection method are briefly summarized in Table 4-1.
- In addition to who makes the decision, characteristics specific to the organization—such as the level of firm diversification, level of vertical integration, or extent of growth opportunities—can also influence any investment or project selection decision (Dewan et al., 1998; Fox, 2013; Harvard Business Review, 2009; Luftman, 2004; Yoo et al., 2006; Thomas and Fernandez, 2008; Weill and Ross, 2009).

TABLE 4-1 Characteristics of Alternative Methods for Making Information Systems Identification and Selection Decisions

Selection Method	Characteristics
Top Management	Greater strategic focus
	Largest project size
	Longest project duration
	Enterprise-wide consideration
Steering Committee	Cross-functional focus
	Greater organizational change
	Formal cost–benefit analysis
	Larger and riskier projects
Functional Area	Narrow, nonstrategic focus
	Faster development
	Fewer users, management layers, and business functions involved
Development Group	Integration with existing systems focus
	Fewer development delays
	Less concern with cost–benefit analysis

(*Source:* Based on McKeen, Guimaraes, and Wetherbe, 1994; GAO, 2000.)

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- Of all the possible project sources, those identified by **top management** and **steering committees** most often reflect the broader needs of the organization.
- This committee occurs because top management and steering business objectives and constraints. Projects identified by top managements or by diverse steering committee are therefore referred to as coming a **top-down source**.
- Projects identified by a functional manager, business unit, or by the information systems development group are often designed for a particular business need within a given business unit. In other words, these projects may not reflect the overall objectives of the organization.
- This does not mean that projects identified by individual managers, business units, or the IS development group are deficient, only that they may not consider broader organizational issues.
- Project initiatives stemming from managers, business units, or the development group are generally referred to as coming from a **bottom-up source**.

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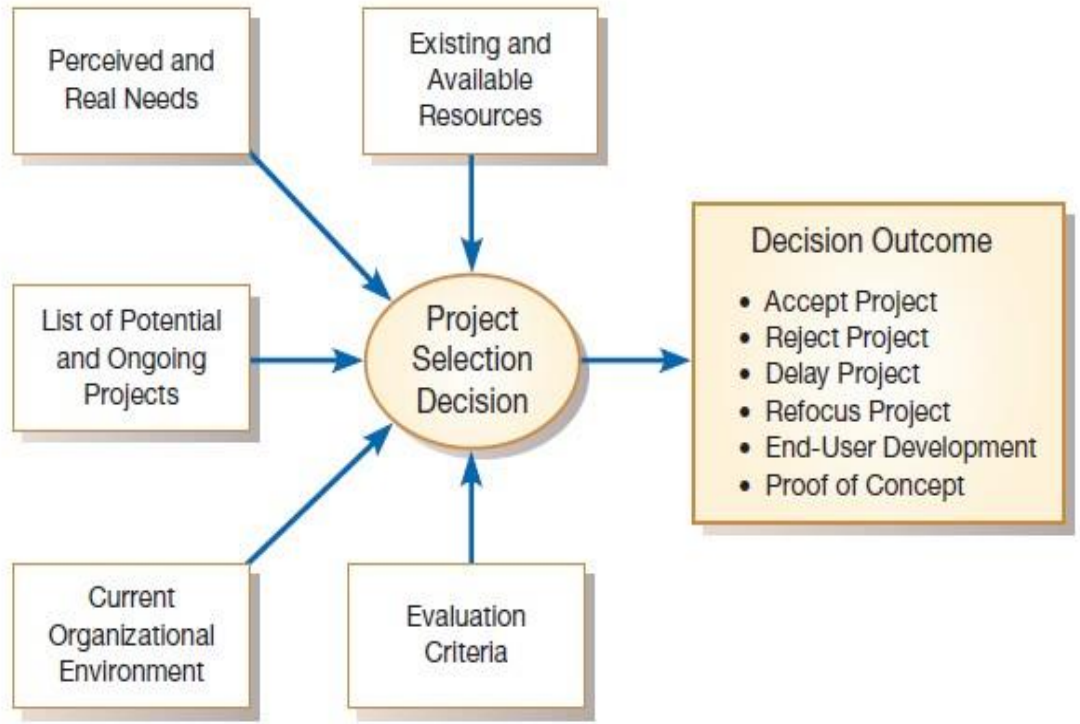
2. Classifying and ranking IS development projects. The second major activity in the project identification and selection process focuses on assessing (to judge or decide the amount, value, quality or importance of something)the relative merit of potential projects. As with the project identification process, classifying and ranking projects can be performed by top managers, a steering committee, business units, or the IS development group. Additionally, the criteria used when assigning the relative merit of a given project can vary.

3. Selecting IS development projects. The final activity in the project identification and selection process is the actual selection of projects for further development. Project selection is a process of considering both short- and long-term projects and selecting those most likely to achieve business objectives. Additionally, as business conditions change over time, the relative importance of any single project may substantially change. Thus, the identification and selection of projects is a very important and ongoing activity.

FIGURE 4-3
Project selection decisions must consider numerous factors and can have numerous outcomes



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- Numerous factors must be considered when making project selection decisions. Figure 4-3 shows that a selection decision requires that the perceived needs of the organization, existing systems and ongoing projects, resource availability, evaluation criteria, current business conditions, and the perspectives of the decision makers will all play a role in project selection decisions.
- Numerous outcomes can occur from this decision process. Of course, projects can be accepted or rejected.
- Acceptance of a project usually means that funding to conduct the next phase of the SDLC has been approved. Rejection means that the project will no longer be considered for development.
- However, projects may also be conditionally accepted; they may be accepted pending the approval or availability of needed resources or the demonstration that a particularly difficult aspect of the system can be developed.
- Projects may also be returned to the original requesters, who are told to develop or purchase the requested system.
- Finally, the requesters of a project may be asked to modify and resubmit their request after making suggested changes or clarifications.

Criteria	Weight	Alternative A		Alternative B		Alternative C	
		Rating	Score	Rating	Score	Rating	Score
Requirements							
Real-time data entry	18	5	90	5	90	5	90
Automatic reorder	18	1	18	5	90	5	90
Real-time data query	14	1	14	5	70	5	70
	50		122		250		250
Constraints							
Developer costs	15	4	60	5	75	3	45
Hardware costs	15	4	60	4	60	3	45
Operating costs	15	5	75	1	15	5	75
Ease of training	5	5	25	3	15	3	15
	50		220		165		180
Total	100		342		415		430

FIGURE 4-4
Alternative projects and system design decisions can be assisted using weighted multicriteria analysis

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- One method for deciding among different projects, or when considering alternative designs for a given system, is illustrated in Figure 4-4.
- For example, suppose that, for a given system that has been identified and selected, there are three alternative designs that could be pursued—A, B, or C.
- Let's also suppose that early planning meetings identified three key system requirements and four key constraints that could be used to help make a decision on which alternative to pursue.
- In the left column of Figure 4-4, three system requirements and four constraints are listed.
- **Because not all requirements and constraints are of equal importance, they are weighted based on their relative importance**.
- In other words, you do not have to weight requirements and constraints equally; it is certainly possible to make requirements more or less important than constraints.

- **Deliverables and outcomes:**

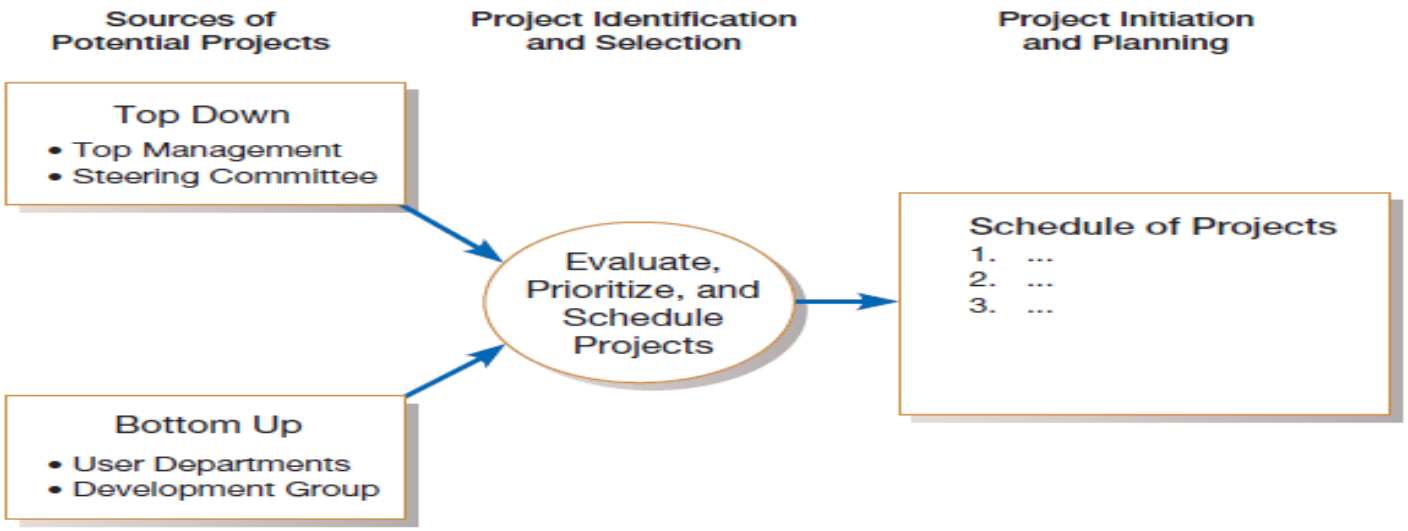


FIGURE 4-5
Information systems development projects come from both top-down and bottom-up initiatives

- The primary deliverable from the first part of the planning phase is **a schedule** of specific IS development projects, coming from both top- down and bottom-up sources, to move into the next part of the planning phase—project initiation and planning (see Figure 4-5).
- An outcome of this phase is the assurance that careful consideration was given to project selection, with a clear understanding of how each project can help the organization **reach its objective**s.
- Due to the principle of **incremental commitment,** a selected project does not necessarily result in a working system.
- After each subsequent SDLC phase, you, other members of the project team, and organizational officials will reassess your project to determine **whether the business conditions have changed or whether a more detailed understanding of a system's costs, benefits, and risks would suggest that the project is not as worthy as previously thought**. Many organizations have found that in order to make good project selection decisions, a clear understanding of overall organizational business strategy and objectives is required.
- This means that a clear understanding of the business and the desired role of information systems in achieving organizational goals is a precondition to improving the identification and selection process.

- **Corporate and Information Systems Planning**
- organizations have not traditionally used a systematic planning process when determining how to allocate IS resources.
- Instead, projects have often resulted from attempts to solve isolated organizational problems. In effect, organizations have asked the question: "What procedure (**application program)** is required to solve this particular problem as it exists today?"
- The difficulty with this approach is that the required organizational procedures are likely to change **over time** as the environment changes.
- For example, a company may decide to change its method of billing customers or a university may change its procedure for registering students.
- When such changes occur, it is usually necessary to again modify existing information systems.

- **In contrast, planning-based approaches** essentially ask the question: "What **information** (or data) requirements will satisfy the decision- making needs or business processes of the enterprise today and well into the future?"
- A major advantage of this approach is that an organization's informational needs are less likely to change (or will change more slowly) than its business processes. For example, unless an organization fundamentally changes its business, its underlying data structures may remain reasonably stable for more than 10 years.
- However, the procedures used to access and process the data may change many times during that period. Thus, the challenge of most organizations is to design comprehensive information models containing data that are relatively independent from the languages and programs used to access, create, and update them.
- The need for improved information systems project identification and selection is seen when we consider factors such as the following:

- **Corporate Strategic Planning**
- A prerequisite for making effective project selection decisions is to gain a clear idea of where an organization is, its vision of where it wants to be in the future, and how to make the transition to its desired future state. Figure 4-6 represents this as a three-step process.
- The **first step** focuses on gaining an understanding of the current enterprise. In other words,

  if you don't know where you are, it is

  impossible to tell where you are going.
- **Next**, top management must determine where it wants the

  enterprise to be in the future.
- Finally, after gaining an understanding of the

  current and future enterprise, a strategic plan can be developed to guide this transition.

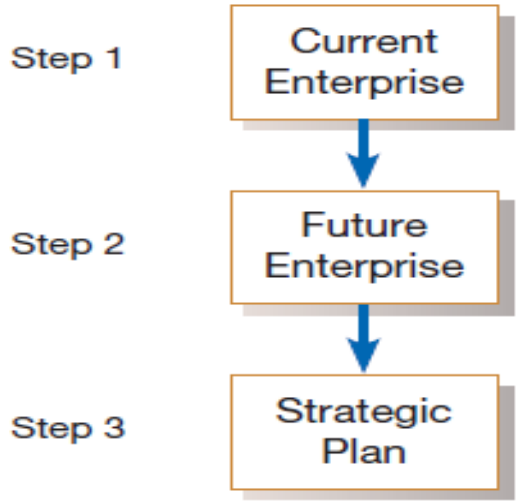


FIGURE 4-6
Corporate strategic planning is a three-step process

- The process of developing and refining models of the current and future enterprise as well as a transition strategy is often referred to as **corporate strategic planning. During corporate strategic** planning, executives typically develop a mission statement, statements of future corporate objectives, and strategies designed to help the organization reach its objectives.
- All successful organizations have a mission. The **mission statement of a company** typically states in very simple terms what business the company is in.
- After reviewing PVF's mission statement, it becomes clear that it is in the business of constructing and selling high-quality wood furniture to the general public, businesses, and institutions such as universities and hospitals.

Pine Valley Furniture
Corporate Mission Statement

We are in the business of designing, fabricating, and selling to retail stores high-quality wood furniture for household, office, and institutional use. We value quality in our products and in our relationships with customers and suppliers. We consider our employees our most critical resource.

- After defining its mission, an organization can then define its objectives.
- **Objective statements refer to "broad and timeless" goals for the organization. These** goals can be expressed as a series of statements that are either qualitative or quantitative but that typically do not contain details likely to change substantially over time.
- Objectives are often referred to as critical success factors. Here, we will simply use the term objectives. The objectives for PVF are shown in Figure 4-8, with most relating to some aspect of the organizational mission.
- For example, the second objective relates to how PVF views its relationships with customers. This goal would suggest that PVF might want to invest in a web-based order tracking system that would contribute to high-quality customer service. Once a company has defined its mission and objectives, a **competitive strategy can be formulated.**

Pine Valley Furniture
Statement of Objectives

1. PVF will strive to increase market share and profitability (prime objective).
2. PVF will be considered a market leader in customer service.
3. PVF will be innovative in the use of technology to help bring new products to market faster than our competition.
4. PVF will employ the fewest number of the highest-quality people necessary to accomplish our prime objective.
5. PVF will create an environment that values diversity in gender, race, values, and culture among employees, suppliers, and customers.

- Strive (to try very hard to do something or to make something happen, especially for a long time or against difficulties)

- A **competitive strategy is the method by which an organization attempts to** achieve its mission and objectives.
- In essence, the strategy is an organization's game plan for playing in the competitive business world. In his classic book on competitive

  strategy, Michael Porter (1980) defined three generic strategies—low-cost producer, product differentiation, and product focus or niche—for reaching corporate objectives (see Table 4-3). These generic strategies allow you to more easily compare two companies in the same industry that may not employ the same competitive strategy.

TABLE 4-3 Generic Competitive Strategies

Strategy	Description
Low-Cost Producer	This strategy reflects competing in an industry on the basis of product or service cost to the consumer. For example, in the automobile industry, the South Korean–produced Hyundai is a product line that competes on the basis of low cost.
Product Differentiation	This competitive strategy reflects capitalizing on a key product criterion requested by the market (for example, high quality, style, performance, roominess). In the automobile industry, many manufacturers are trying to differentiate their products on the basis of quality (e.g., "At Ford, quality is job one.").
Product Focus or Niche	This strategy is similar to both the low-cost and differentiation strategies but with a much narrower market focus. For example, a niche market in the automobile industry is the convertible sports car market. Within this market, some manufacturers may employ a low-cost strategy and others may employ a differentiation strategy based on performance or style.

niche: a job or position which is very suitable for someone, especially one that they like or an area or position which is exactly suitable for a small group of the same type

- **Information Systems Planning**
- The second planning process that can play a significant role in the quality of project identification and selection decisions is called **information system planning (ISP).**
- **ISP is and orderly means of assessing the information needs of an organization and defining the information** systems, databases, and technologies that will best satisfy those needs.
- This means that during ISP you (or, more likely, senior IS managers responsible for the IS plan) must **model current** and **future organization** informational needs and develop strategies and project plans to migrate the current information systems and technologies to their desired future state.
- ISP is a **top-down process.**

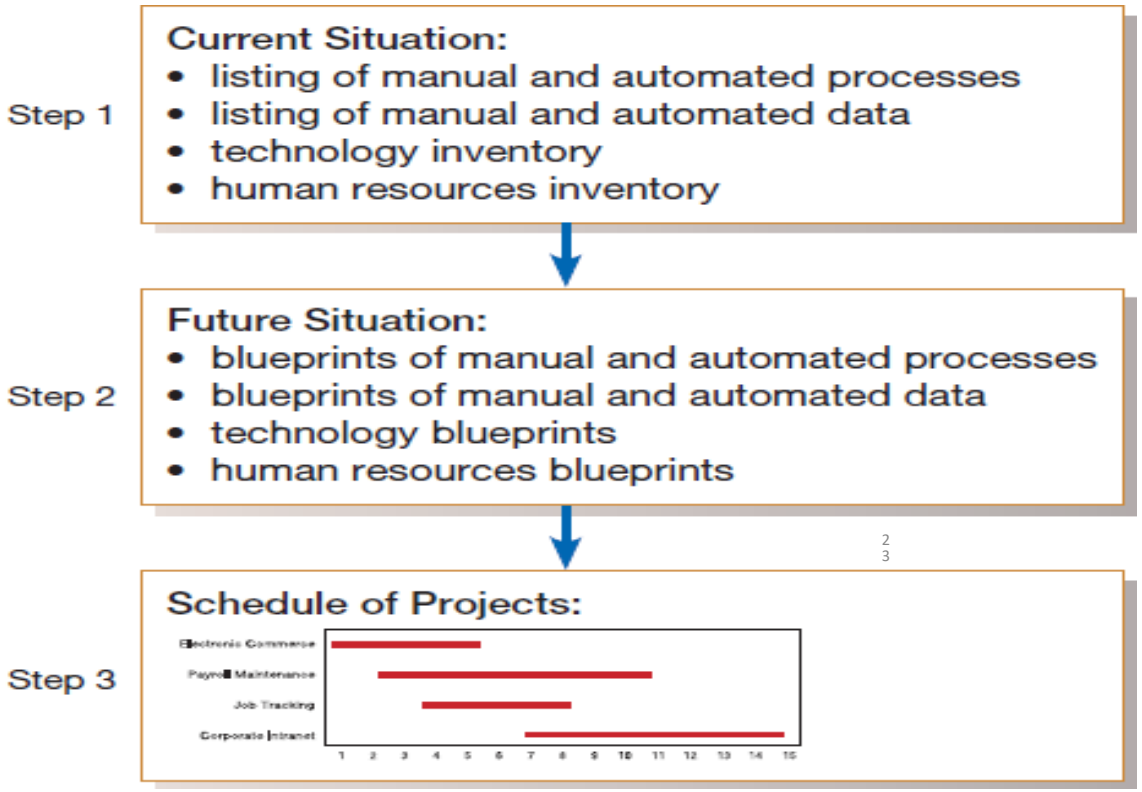


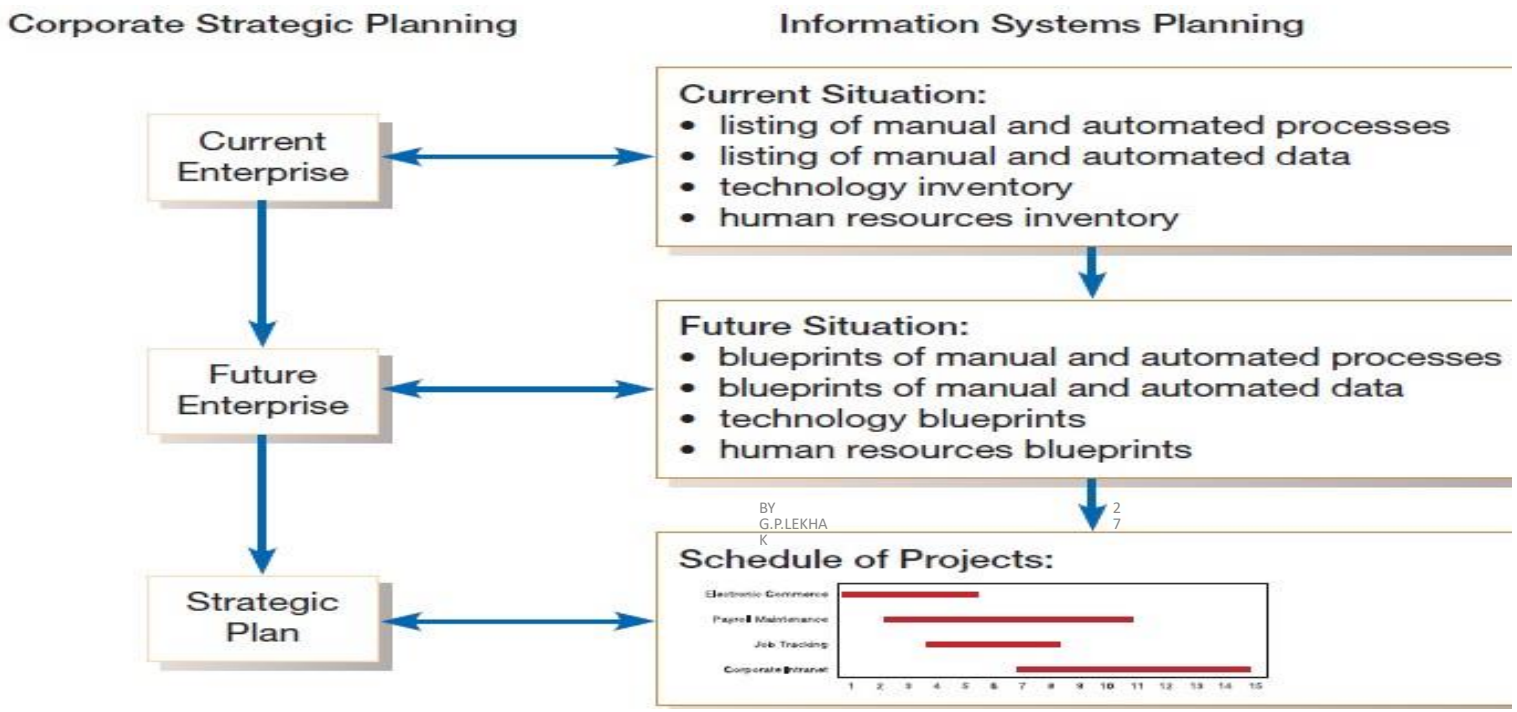
Figure 4-9

Information systems planning is a threestep process

- The three key activities of this modeling process are represented in Figure 4-9. Like corporate strategic planning, ISP is a three-step process in which the first step is to **assess current IS-related assets**—human resources, data, processes, and technologies.
- Next, **target blueprints** of these resources are developed. These blueprints reflect the desired **future state** of resources needed by the organization to reach its objectives as defined during strategic planning. Finally, **a series of scheduled projects** is defined to help move the organization from its current to its future desired state. **(**Of course, scheduled projects from the ISP process are just one source for projects.
- Others include bottom-up requests from managers and business units).

- For example, a project may focus on reconfiguration of a telecommunications network to speed data communications or it may restructure work and data flows between business areas. Projects can include not only the development of new information systems or the modification of existing ones, but also the acquisition and management of new systems, technologies, and platforms. These three activities
- parallel those of corporate strategic planning, and this relationship is shown in Figure 4-10. Numerous methodologies such as Business Systems Planning (BSP) and Information Engineering (IE) have been developed to support the ISP process (see Amrollahi et al., 2014; Segars and Grover, 1999); most contain the following three key activities:

- **1. Describe the current situation**. The most widely used approach for describing the current organizational situation is generically referred to as top-down planning. **Top-down planning attempts to gain a broad understanding of the informational** 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.
- 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; it also has the advantage of identifying pressing organizational problems.
- Yet, the 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.


Corporate Strategic Planning
Information Systems Planning
Current Enterprise
Future Enterprise
Strategic Plan
Current Situation:
• listing of manual and automated processes
• listing of manual and automated data
• technology inventory
• human resources inventory
Future Situation:
• blueprints of manual and automated processes
• blueprints of manual and automated data
• technology blueprints
• human resources blueprints
Schedule of Projects:
Electronic Commerce
Payroll Maintenance
Job Tracking
Corporate Intranet
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

2. Describing the target situation, trends, and constraints

After describing the current situation, the next step in the ISP (information system planning) 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 IS** (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 (something which controls what you do by keeping you within particular limits).

- **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 to be done, how, when, and by whom in the organization.
- 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 plan.

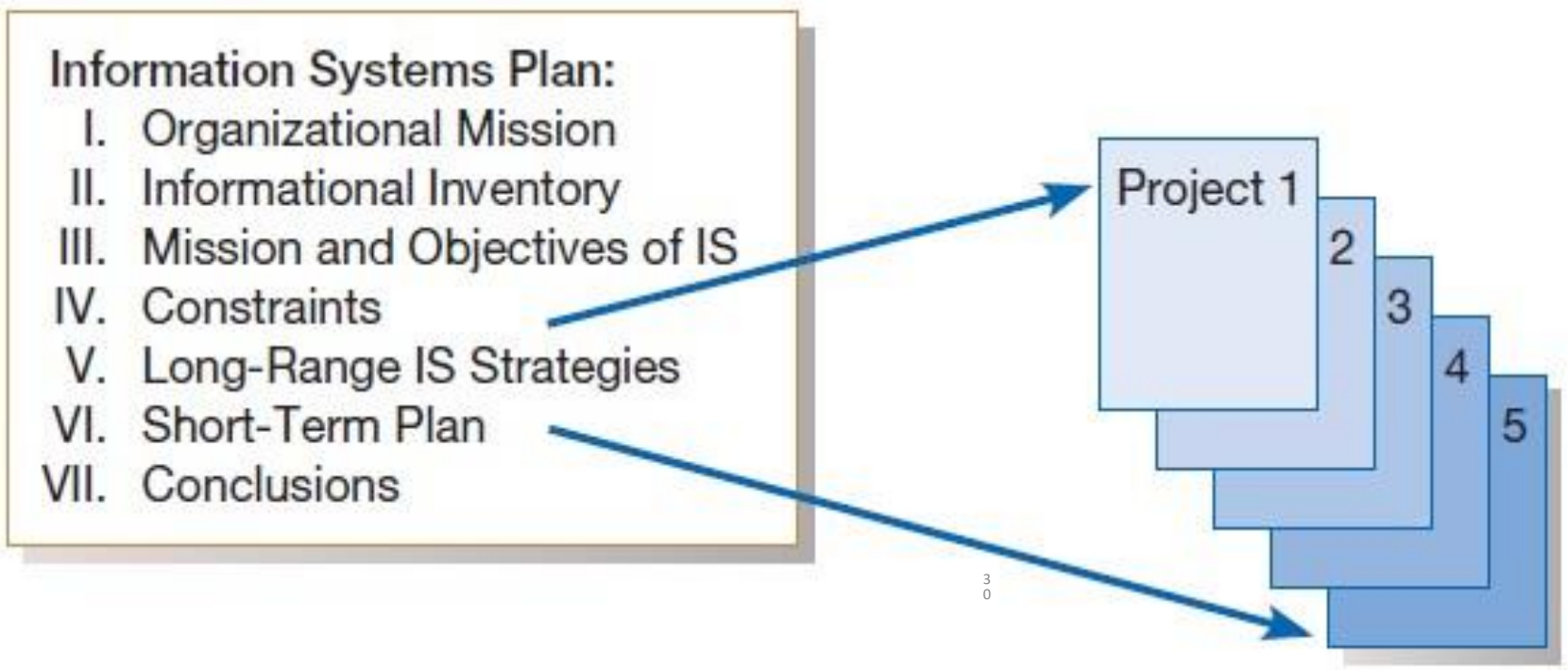


Figure 4-16
Systems development projects flow from the information systems plan

2.2 Initiating and planning system development projects

- **Introduction:** (111)
- During the first phase of the systems development life cycle (SDLC) i.e planning, two primary activities are performed.
- **The first, project identification and selection**, focuses on the activities during which the need for a new or enhanced system is recognized. Thus, project identification and selection is often thought of as a "pre project" step in the life cycle.
- The **next step** is to conduct **a more detailed assessment** during project initiating and planning. This assessment does not focus on how the proposed system will operate but rather on understanding the **scope of a proposed project** and its **feasibility of completion** given the available resources.
- In the next section, the project initiation and planning process is briefly reviewed. Numerous techniques for assessing project feasibility are then described.

- **Initiating and planning systems development projects**
- A key consideration when conducting **project initiation and planning (PIP)** is deciding **when PIP ends** and when **analysis**, the next phase of the SDLC, **begins**. This is a concern because many activities performed during PIP could also be completed during analysis. Pressman (2014) speaks of **three important questions that must be considered** when making this decision on the division between PIP and analysis:

  1.How much effort should be expended on the project initiation and planning process?

  2.Who is responsible for performing the project initiation and planning process?

  3.Why is project initiation and planning such a challenging activity?

- Finding an answer to the **first question**, how much effort should be expended on the PIP process, is often difficult. Practical experience has found, however, that the time and effort spent on initiation and planning activities easily pay for themselves later in the project. Proper and insightful project planning, including determining project scope as well as identifying project activities, can easily reduce time in later project phases. A **rule of thumb is that between 10 and 20 percent** of the entire development effort **should be expended on the PIP study**. Thus, you should not be reluctant to spend considerable time in PIP in order to fully understand the motivation for the requested system.
- **For the second question**, who is responsible for performing PIP, most organizations assign an experienced **systems analyst**, or a team of analysts for large projects, to perform PIP. The analyst will work with the **proposed customers** (managers and users) of the system and other technical development staff in preparing the **final plan**. Experienced analysts working with customers who fully understand their information services needs should be able to perform PIP without the detailed analysis **typical of the analysis phase of the life cycle.**

- Less-experienced analysts with customers who only vaguely (not enough)understand their needs will likely expend more effort during PIP in order to be certain that the project scope and work plan are feasible.
- As to the third question, PIP is viewed as a challenging activity because the objective of the PIP study is to transform a **vague** system request document into a **tangible project description**. This is an open-ended process. Getting all parties to agree on the direction of a project may be difficult for cross-department projects where different parties have different business objectives. Thus, more complex organizational settings

  for projects will result in more time required for analysis of the current and proposed systems during PIP.

- **The process of initiating and planning IS development projects**

  Project initiation focuses on activities designed to assist in organizing a team to conduct project planning. During initiation, one or more analysts are assigned to work with a customer—that is, a member of the business group that requested or will be affected by the project—to establish work standards and communication procedures.
- Examples of the types of activities performed are shown in Table 5-1. Depending upon the size, scope, and complexity of the project, some project initiation activities may be unnecessary or may be very involved. Also, many organizations have established procedures for assisting with common initiation activities.

TABLE 5-1 Elements of Project Initiation

- Establishing the Project Initiation Team
- Establishing a Relationship with the Customer
- Establishing the Project Initiation Plan
- Establishing Management Procedures
- Establishing the Project Management Environment and Project Workbook
- Developing the Project Charter

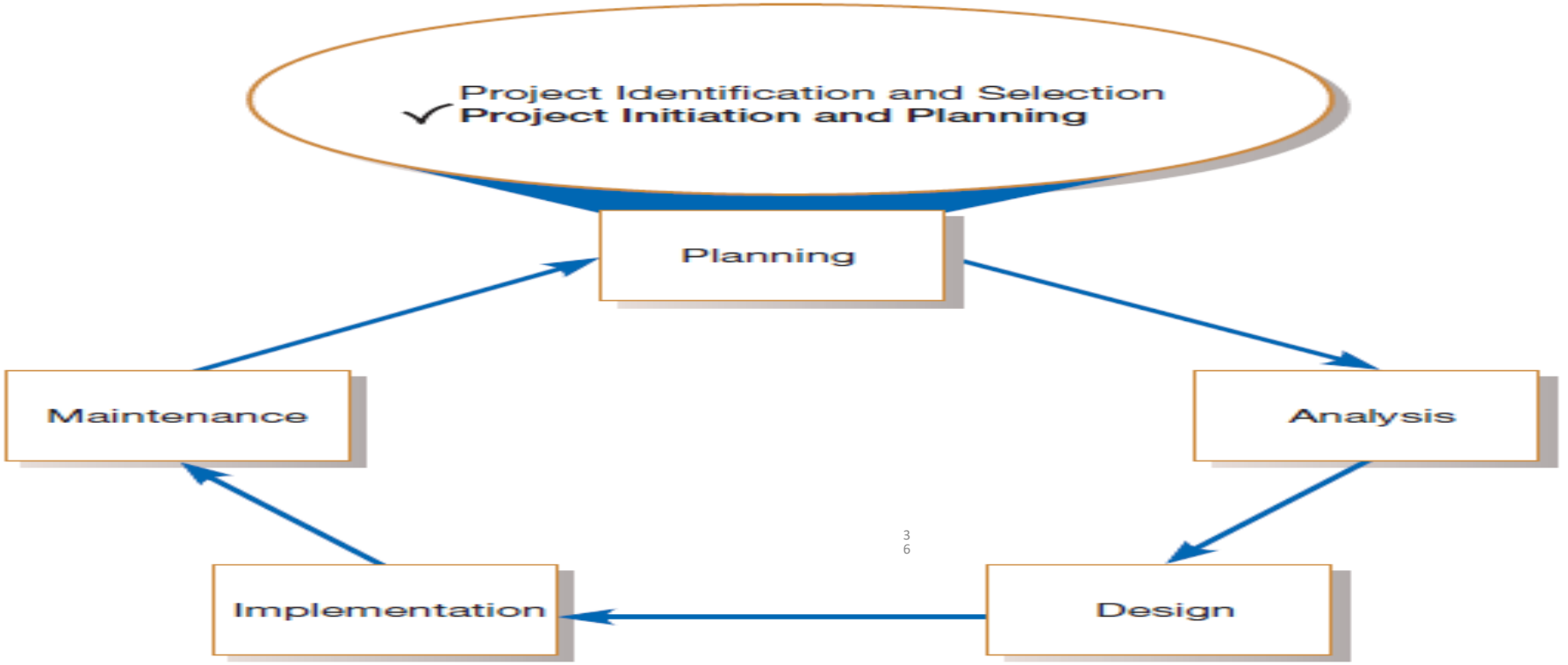


FIGURE 5-1
Systems development life cycle with project initiation and planning highlighted

- Project **planning is the process of defining clear, discrete activities and the work needed to complete each activity within a single project**. The objective of the project planning process is the development of a **Baseline Project Plan (BPP)** and the **Project Scope Statement (PSS)** (Morris and Sember, 2008). The BPP becomes the foundation for the remainder of the development project. The PSS produced by the team clearly outlines the objectives and constraints of the project for the customer. As with the project initiation process, the size, scope, and complexity of a project will dictate the comprehensiveness of the project planning process and resulting documents. Further, numerous assumptions about resource availability and potential problems will have to be made. Analysis of these assumptions and system costs and benefits forms a **business case. The range of activities performed during project planning** is listed in Table 5-2.

TABLE 5-2 Elements of Project Planning

- Describing the Project Scope, Alternatives, and Feasibility
- Dividing the Project into Manageable Tasks
- Estimating Resources and Creating a Resource Plan
- Developing a Preliminary Schedule
- Developing a Communication Plan
- Determining Project Standards and Procedures
- Identifying and Assessing Risk
- Creating a Preliminary Budget
- Developing the Project Scope Statement
- Setting a Baseline Project Plan

- **Deliverables and outcomes**
- The major outcomes and deliverables from the project initiation and planning phase are the **Baseline Project Plan** and the **Project Scope Statement (PSS)**.
- The **Baseline Project Plan (BPP) contains all information collected and analyzed during project initiation and** planning.
- The plan reflects the best estimate of the project's **scope**, **benefits, costs, risks**, and resource requirements given the current understanding of the project.
- The **BPP** specifies detailed project activities for the next life cycle phase— **analysis**—and less detail for subsequent project phases (because these depend on the results of the analysis phase).
- Similarly, benefits, costs, risks, and resource requirements will become more specific and quantifiable as the project progresses.

- **The BPP is used by the project selection committee to decide whether the project should be accepted, redirected, or canceled**.
- If selected, the BPP becomes the **foundation** document for all subsequent SDLC activities; however, it is also expected to evolve (to develop gradually) as the project evolves. That is, as new information is learned during subsequent SDLC phases, the baseline plan will be updated.

- The **Project Scope Statement (PSS) is a short document prepared for the customer** that describes what the project will deliver and outlines all work required to complete the project. The PSS ensures that both you and your customer gain a common understanding of the project. It is also a very useful communication tool. The PSS is a very easy document to create because it typically consists of a high-level summary of the BPP information. Depending upon your relationship with your customer, the role of the PSS may vary.
- At one extreme, the PSS can be used as the basis of a formal contractual agreement outlining firm deadlines, costs, and specifications. At the other extreme, the PSS can simply be used as a communication vehicle to outline the current best estimates of what the project will deliver, when it will be completed, and the resources it may consume. A contract programming or consulting firm, for example, may establish a very formal relationship with a customer and use a PSS that is extensive and formal. Alternatively, an internal development group may develop a PSS that is only one to two pages in length and **is intended to inform customers** rather than to set contractual obligations and deadlines.

- **Assessing Project Feasibility**
- All projects are feasible given unlimited resources and infinite time (Pressman, 2014). Unfortunately, most projects must be developed within tight budgetary and time constraints. This means that assessing project feasibility is a required activity for all information systems projects and is a potentially large undertaking. It requires that you, as a systems analyst, evaluate a wide range of factors. Typically, the relative

  importance of these factors will vary from project to project. Most feasibility factors are represented by the following categories:
- Economic
- Technical
- Operational
- Scheduling
- Legal and contractual
- Political

- **Assessing Economic Feasibility**
- The purpose of assessing **economic feasibility is to identify the financial benefits and** costs associated with the development project (Laplante, 2006). Economic feasibility is often referred to as cost–benefit analysis. During project initiation and planning, it will be impossible for you to precisely define all benefits and costs related to a particular project. Yet it is important that you spend adequate time identifying and quantifying these items or it will be impossible for you to conduct an adequate economic analysis and make meaningful comparisons between rival projects. Here we will describe typical benefits and costs resulting from the development of an information system and provide several **useful worksheets for recording costs and benefits**. Additionally, **several common techniques for making cost–benefit calculations are presented**. These worksheets and techniques are used after each SDLC phase as the project is reviewed in order to decide whether to continue, redirect, or kill a project.

- **Determining Project Benefits**

  An information system can provide many benefits to an organization. For example, a new or renovated information system can automate

  monotonous jobs and reduce errors; provide innovative services to customers and suppliers; and improve organizational efficiency, speed, flexibility, and morale. In general, the benefits can be viewed as being both **tangible** and **intangible**. **Tangible benefits refer to items that can be measured in dollars and with certainty. Examples** of tangible benefits might include reduced personnel expenses, lower transaction costs, or higher profit margins. It is important to note that not all tangible benefits can be easily quantified (to measure something in amount). For example, a tangible benefit that allows a company to perform a task in 50 percent of the time may be difficult to quantify in terms of hard dollar savings. Most tangible benefits will fit within the following

  categories:

- Cost reduction and avoidance
- Error reduction
- Increased flexibility
- Increased speed of activity
- Improvement of management planning and control
- Opening new markets and increasing safe opportunities

- **Intangible benefits** of the system could not be quantified. **Intangible benefits refer to items that cannot be easily measured in dollars or with** certainty. Intangible benefits may have direct organizational benefits, such as the

  improvement of employee morale, or they may have broader societal implications, such as the **reduction of waste creation or resource consumption**. Table 5-3 lists numerous intangible benefits often associated with the development of an information system. Actual benefits will vary from system to system. After determining project benefits, **project costs** must be identified.

TABLE 5-3 Intangible Benefits from the Development of an Information System

• Competitive necessity	• More confidence in decision quality
• More timely information	• Improved processing efficiency
• Improved organizational planning	• Improved asset utilization
• Increased organizational flexibility	• Improved resource control
• Promotion of organizational learning and understanding	• Increased accuracy in clerical operations
• Availability of new, better, or more information	• Improved work process that can improve employee morale or customer satisfaction
• Ability to investigate more alternatives	• Positive impacts on society
• Faster decision making	• Improved social responsibility
	• Better usage of resources ("greener")

(Source: Based on Parker and Benson, 1988; Brynjolfsson and Yang, 1997; Keen, 2003; Cresswell, 2004.)

- **Determining Project Costs**
- Similar to benefits, an information system can have both tangible and intangible costs. **Tangible costs refer to items that you can easily measure** in dollars and with certainty. From an IS development perspective, tangible costs include items such as hardware costs, labor costs, and operational costs including employee training and building renovations. Alternatively, **intangible costs are items** that you cannot easily measure in terms of dollars or with certainty. Intangible costs

  can include **loss of customer goodwill**, **employee morale**, or **operational inefficiency.** One goal of a cost–benefit analysis is to accurately determine the **total cost of ownership (TCO)** for an investment (Nash, 2008**). TCO is focused on understanding** not only the total cost of acquisition but also all costs associated with **ongoing use and maintenance of a system.** Consequently, besides tangible and intangible costs, you can distinguish IS-related development costs as either one- time or recurring.

- **One-time costs refer to those associated with project initiation and development and** the start-up of the system. These costs typically encompass activities such as systems development, new hardware and software purchases, user training, site preparation, and data or system conversion. When conducting an **economic cost–benefit analysis**, a worksheet should be created for capturing these expenses. For very large projects, one-time costs may be staged over one or more years. In these cases, a separate onetime cost worksheet should be created for each year. This separation will make it easier to perform present value calculations (described later). **Recurring costs refer** to those costs resulting from the **ongoing evolution** and use of the system. Examples of these costs typically include the **following:**
- Application software maintenance
- Incremental data storage expenses
- Incremental communications
- New software and hardware leases
- Supplies and other expenses (e.g., paper, forms, data center personnel)

- Both one-time and recurring costs can consist of items that are fixed or variable in nature. Fixed costs are costs that are billed or incurred at a regular interval and usually at a fixed rate (a facility lease payment). Variable costs are items that vary in relation to usage (long-distance phone charges). In next section we discuss about the relationship between time and money.
- **The Time Value of Money**

  Most techniques used to determine economic feasibility encompass the concept of the **time value of money (TVM), which reflects the notion** that **money available today is worth more than the same amount tomorrow**. As previously discussed, the development of an information system has both one-time and recurring costs. Furthermore, benefits from systems development will likely occur sometime in the future. Because many projects may be competing for the same investment

  dollars and may have different useful life expectancies, all costs and benefits must be viewed in relation to their present value when comparing investment options.

ONE-TIME COSTS WORKSHEET Customer Tracking System Project	Year 0
A. Development costs	$20,000
B. New hardware	15,000
C. New (purchased) software, if any	
1. Packaged applications software	5,000
2. Other _____	0
D. User training	2,500
E. Site preparation	0
F. Other _____	0
TOTAL one-time costs	$42,500

Figure 5-4
One-time costs for Customer Tracking System (Pine Valley Furniture

RECURRING COSTS WORKSHEET Customer Tracking System Project	Year 1 through 5
A. Application software maintenance	$25,000
B. Incremental data storage required: 20 GB $50 (estimated cost/GB = $50)	1000
C. Incremental communications (lines, messages, . . .)	2000
D. New software or hardware leases	0
E. Supplies	500
F. Other _____	0
TOTAL recurring costs	$28,500

Figure 5-5
Recurring costs for Customer Tracking System (Pine Valley Furniture)

- A simple example will help in understanding the TVM. Suppose you want to buy a used car from an acquaintance (a person that you have met but do not know well) and she asks that you make three payments of $1500 for three years, beginning next year, for a total of $4500. If she would agree to a single lump-sum payment at the time of sale (and if you had the money!), what amount do you think she would agree to? Should the single payment be $4500? Should it be more or less?

  To answer this question, we must consider the time value of money.

- Most of us would gladly accept $4500 today rather than three payments of $1500, because a dollar today (or $4500 for that matter) is worth more than a dollar tomorrow or next year, given that money can be invested. **The rate at which money can be borrowed or invested is referred to as the cost of capital**, and is called the **discount rate** for TVM calculations. Let's suppose that the seller could put the money received for the sale of the car in the bank and receive a 10 percent return on her investment. A simple formula can be used when figuring out the **present value of the three $1500** payments:

$$PV_n = Y \times \frac{1}{(1 + i)^n}$$

where PV^n is the present value of Y dollars n years from now when i is the discount rate.

From our example, the present value of the three payments of $1500 can be calculated as

$$PV_1 = 1500 \times \frac{1}{(1 + .10)^1} = 1500 \times .9091 = 1363.65$$

$$PV_2 = 1500 \times \frac{1}{(1 + .10)^2} = 1500 \times .8264 = 1239.60$$

$$PV_3 = 1500 \times \frac{1}{(1 + .10)^3} = 1500 \times .7513 = 1126.95$$

where PV_1, PV_2, and PV_3 reflect the present value of each $1500 payment in years 1, 2, and 3, respectively.

To calculate the *net present value (NPV)* of the three $1500 payments, simply add the present values calculated previously (NPV = PV_1 = PV_2 = PV_3 = 1363.65 = 1239.60 = 1126.95 = $3730.20). In other words, the seller could accept a lump-sum payment of $3730.20 as equivalent to the three payments of $1500, given a discount rate of 10 percent.

Given that we now know the relationship between time and money, the next step in performing the economic analysis is to create a summary worksheet reflecting the present values of all benefits and costs as well as all pertinent analyses. Due to the fast pace of the business world, PVF's System Priority Board feels that the useful life

- **Break-even analysis**

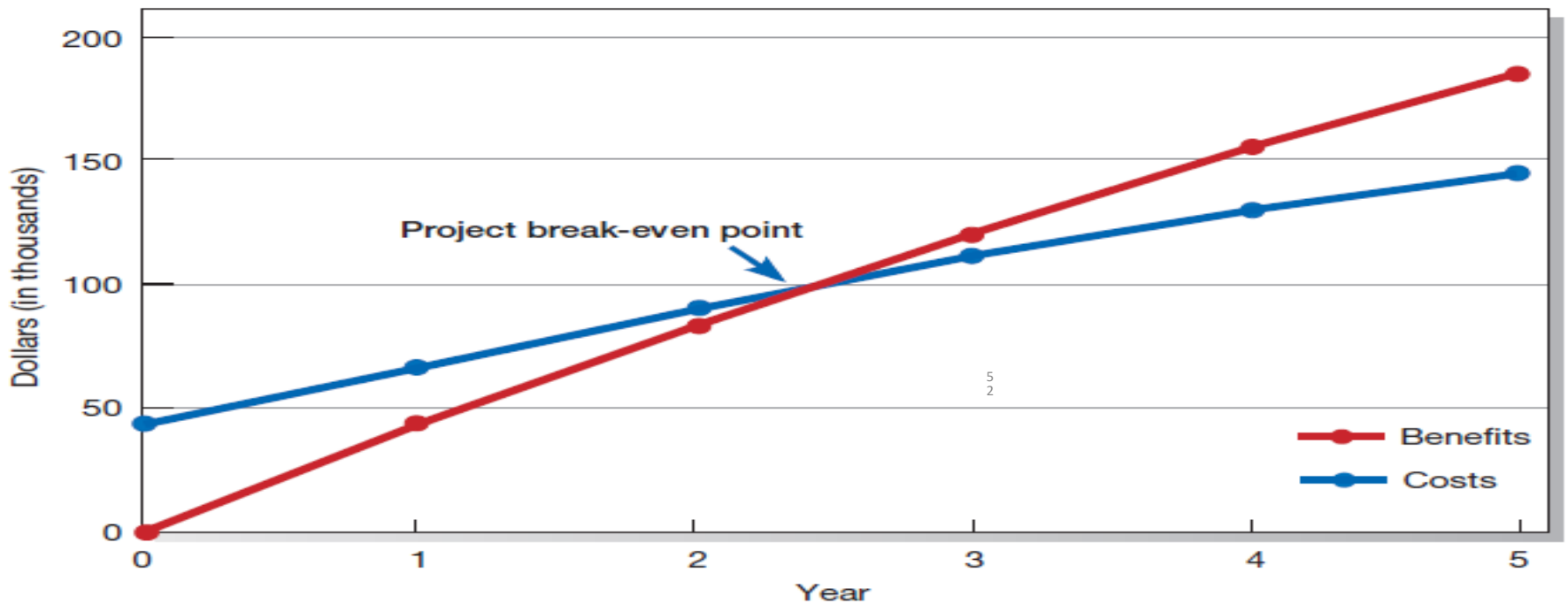
  The objective of the break-even analysis is to discover at what point (if ever) **benefits equal costs** (i.e., when breakeven occurs). To conduct this analysis, the NPV of the yearly cash flows are determined. Here, the yearly cash flows are calculated by subtracting both the one-time cost and the present values of the recurring costs from the present value of the yearly benefits. The overall NPV of the cash flow reflects the total cash flows for all preceding years. Examination of line 30 of the worksheet shows that breakeven occurs between years 2 and 3. Because year 3 is the first in which the overall NPV cash flow figure is nonnegative, the identification of what point during the year breakeven occurs can be derived as follows:

$$\text{Break-Even Ratio} = \frac{\text{Yearly NPV Cash Flow} - \text{Overall NPV Cash Flow}}{\text{Yearly NPV Cash Flow}}$$

Using data from Figure 5-6,

$$\text{Break-Even Ratio} = \frac{15{,}303 - 9139}{15{,}303} = .403$$

	A	B	C	D	E	F	G	H
1	***Pine Valley Furniture***							
2	***Economic Feasibility Analysis***							
3	***WebStore Project***							
4								
5				Year of Project				
6		*Year 0*	*Year 1*	*Year 2*	*Year 3*	*Year 4*	*Year 5*	*TOTALS*
7	Net economic benefit	$0	$50,000	$50,000	$50,000	$50,000	$50,000	
8	Discount Rate (12%)	*1.0000*	*0.8929*	*0.7972*	*0.7118*	*0.6355*	*0.5674*	
9	PV of Benefits	$0	$44,643	$39,860	$35,589	$31,776	$28,371	
10								
11	*NPV of all BENEFITS*	$0	$44,643	$84,503	$120,092	$151,867	$180,239	**$180,239**
12								
13	*One-time COSTS*	($42,500)						
14								
15	Recurring Costs	$0	($28,500)	($28,500)	($28,500)	($28,500)	($28,500)	
16	Discount Rate (12%)	*1.0000*	*0.8929*	*0.7972*	*0.7118*	*0.6355*	*0.5674*	
17	PV of Recurring Costs	$0	($25,446)	($22,720)	($20,286)	($18,112)	($16,172)	
18								
19	*NPV of All COSTS*	($42,500)	($67,946)	($90,666)	($110,952)	($129,064)	($145,236)	**($145,236)**
20								
21								
22	*Overall NPV*							**$35,003**
23								
24								
25	*Overall ROI - (Overall NPV / NPV of All COSTS)*							**0.24**
26								
27								
28	*Break-Even Analysis*							
29	Yearly NPV Cash Flow	($42,500)	$19,196	$17,140	$15,303	$13,664	$12,200	
30	Overall NPV Cash Flow	($42,500)	($23,304)	($6,164)	$9,139	$22,803	$35,003	
31								
32	Project break-even occurs between years 2 and 3							
33	Use first year of positive cash flow to calculate break-even fraction - ((15303 - 9139) / 15303) = .403							
34	***Actual break-even occurred at 2.4 years***							
35								


200
150
100
50
0
Dollars (in thousands)
Project break-even point
Benefits
Costs
0
1
2
3
4
5
Year

- **Assessing Technical Feasibility**
- The purpose of assessing **technical feasibility is to gain an understanding of the organization's ability to construct the proposed system**. This analysis should include an assessment of the development group's understanding of the possible target hardware, software, and operating environments to be used, as well as system size, complexity, and the group's experience with similar systems. It is important to note that all projects have risk and that risk is not necessarily something to avoid. Yet it is also true that, because organizations typically expect a greater return on their investment for riskier projects, understanding the sources and types of technical risks proves to be a valuable tool when you assess a project. Also, risks need to be managed in order to be minimized; you should, therefore, identify potential risks as early as possible in a project. The potential consequences of not assessing and managing risks can include the following:

- Failure to attain expected benefits from the project
- Inaccurate project cost estimates
- Inaccurate project duration estimates
- Failure to achieve adequate system performance levels
- Failure to adequately integrate the new system with existing hardware, software, or organizational procedures.
- **The amount of technical risk associated with a given project** is contingent(or depends) on four primary factors: **project size**, project **structure**, the development **group's experience** with the application and technology area, and the **user group's experience** with systems development projects and the application area.
- Large projects are riskier than small projects.

- A system in which the requirements are easily obtained and highly structured will be less risky than one in which requirements are messy, ill-structured, ill- defined, or subject to the judgment of an individual
- The development of a system employing commonly used or standard technology will be less risky than one employing novel (a long printed story about imaginary characters and events) or nonstandard technology.
- A project is less risky when the user group is familiar with the systems development process and application area than if the user group is unfamiliar with them.

Assessing operational feasibility

- Its purpose is to gain an understanding of the degree to which the proposed system will likely solve the business problems or take advantage of the opportunities outlined in the **System Service Request** or **project identification study**. For a project motivated from information systems planning, operational feasibility includes justifying the project

  on the basis of being consistent with or necessary for accomplishing the information systems plan. Your assessment of operational feasibility should include an analysis of how the proposed system will affect organizational structures and procedures. Systems that have substantial and widespread impact on an organization's structure or procedures are typically riskier projects to undertake. Thus, it is important for you to have a clear understanding of how an information system will fit into the current day-to-day operations of the organization.

- **Assessing Schedule Feasibility**
- Another feasibility concern relates to project duration is assessing **schedule feasibility. The purpose of assessing** schedule feasibility is for you, as a systems analyst, to gain an understanding of all potential time frames and completion date schedules can be met and that meeting these dates will be sufficient for dealing with the needs of the organization. Further, detailed activities may only be feasible **if resources are available** when called for in the schedule. For example, the schedule should not call for system testing during rushed business periods or for key project meetings during annual vacation or holiday periods. The schedule of activities produced during project initiation and planning will be very precise and detailed for the analysis phase. The estimated activities and associated times for activities after the analysis phase are typically not as detailed (e.g., it will take two weeks to program the payroll report module) as the life-cycle-phase level (e.g., it will take six weeks for physical design, four months for programming, and so on).

- **This means that assessing schedule feasibility during project initiation and planning is more of a "rough-cut" analysis** of whether the system can be completed within the constraints of the business opportunity or the desires of the users.
- While assessing schedule feasibility you should also evaluate scheduling **trade-offs**. For example, factors such as project team size, availability of key personnel, subcontracting or outsourcing activities, and changes in development environments may all be considered as having a possible impact on the eventual schedule. As with all forms of feasibility, schedule feasibility will be reassessed after each phase when you can specify with greater certainty the details of each step for the next phase.

- **Assessing Legal and Contractual Feasibility**
- A third concern relates to assessing **legal and contractual feasibility issues. In this area, you need to gain an understanding** of any potential legal ramifications (the possible results of an action) due to the construction of the system. Possible considerations might include copyright or nondisclosure infringements (an action that breaks a rule, law, etc), labor laws, antitrust legislation (which might limit the creation of systems to share data with other organizations), foreign trade regulations (e.g., some countries limit access to employee data by foreign corporations), and financial reporting standards, as well as

  current or pending contractual obligations. Contractual obligations may involve ownership of software used in joint ventures, license agreements for use of hardware or software, nondisclosure agreements with partners, or elements of a labor agreement (e.g., a union agreement may preclude certain compensation or work-monitoring capabilities a user may want in a system).

- **Assessing Political Feasibility**
- A final feasibility concern focuses on assessing **political feasibility in which you attempt to gain an understanding of how key stakeholders** within the organization view the proposed system.
- Because information system may affect the distribution of information within the organization, and thus the distribution of power, the construction of an information system can have political ramifications. Those stakeholders not supporting the project may take steps to block, disrupt, or change the intended focus of the project.