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Systems Analysis and Design, 9e

Project Management



Learning Objectives

- Understand how projects are initiated and selected, define a business problem, and determine the feasibility of a proposed project.
- Evaluate hardware and software and the way it supports human interactions with technology.
- Forecast and analyze tangible and intangible costs and benefits.
- Manage a project by preparing a budget, creating a work breakdown structure, scheduling activities, and controlling the schedule and costs.
- Build and manage a project team
- Professionally write and present an effective systems proposal, concentrating on both content and design



Project Management Fundamentals

- Project initiation
- Determining project feasibility
- Activity planning and control
- Project scheduling
- Managing systems analysis team members



Major Topics

- Project initiation
- Determining feasibility
- Determining resources
- Activity planning and control
 - Gantt charts
 - PERT diagrams
- Managing analysis and design activities
- The agile approach



Project Initiation

- Problems in the organization
 - Problems that lend themselves to systems solutions
- Opportunities for improvement
 - Caused through upgrading, altering, or installing new systems



Checking Output, Observing Employee Behavior, and Listening to Feedback Are All Ways to Help the Analyst Pinpoint Systems Problems and Opportunities (Figure 3.1)

To Identify Problems	Look for These Specific Signs:
Check output against performance criteria.	<ul style="list-style-type: none">• Too many errors• Work completed slowly• Work done incorrectly• Work done incompletely• Work not done at all
Observe behavior of employees.	<ul style="list-style-type: none">• High absenteeism• High job dissatisfaction• High job turnover
Listen to external feedback from: Vendors and service providers Customers. Suppliers.	<ul style="list-style-type: none">• Complaints• Suggestions for improvement• Loss of sales• Lower sales



Problem Definition

- Problem statement
 - Paragraph or two stating the problem or opportunity
- Issues
 - Independent pieces pertaining to the problem or opportunity
- Objectives
 - Goals that match the issues point-by-point
- Requirements
 - The things that must be accomplished along with the possible solutions, and constraints, that limit the development of the system
- Use the problem definition to create a preliminary test plan



Problem Definition Steps

- Find a number of points that may be included in one issue
- State the objective
- Determine the relative importance of the issues or objectives
- Identify which objectives are most critical.



Selection Of Projects

- Backing from management
- Appropriate timing of project commitment
- Possibility of improving attainment of organizational goals
- Practical in terms of resources for the system analyst and organization
- Worthwhile project compared with other ways the organization could invest resources



Selection of Projects: Improving Attainment of Organizational Goals

- Improving corporate profits
- Supporting the competitive strategy of the organization
- Improving cooperation with vendors and partners
- Improving internal operations support
- Improving internal decision support so that decisions are more effective
- Improving customer service
- Increasing employee morale



Defining Objectives

Many possible objectives exist including:

- Speeding up a process
- Streamlining a process
- Combining processes
- Reducing errors in input
- Reducing redundant storage
- Reducing redundant output
- Improving system and subsystem integration



Determining Feasibility

- Defining objectives
- Determining resources
 - Operationally
 - Technically
 - Economically

The Three Key Elements of Feasibility Include Technical, Economic, and Operational Feasibility (Figure 3.3)

The Three Key Elements of Feasibility	
Technical Feasibility	<ul style="list-style-type: none">Add on to present systemTechnology available to meet users' needs
Economic Feasibility	<ul style="list-style-type: none">Systems analysts' timeCost of systems studyCost of employees' time for studyEstimated cost of hardwareCost of packaged software or software development
Operational Feasibility	<ul style="list-style-type: none">Whether the system will operate when put in serviceWhether the system will be used



Technical Feasibility

- Can current technical resources be upgraded or added to in a manner that fulfills the request under consideration?
- If not, is there technology in existence that meets the specifications?



Economic Feasibility

- Economic feasibility determines whether value of the investment exceeds the time and cost
- Includes:
 - Analyst and analyst team time
 - Business employee time
 - Hardware
 - Software
 - Software development



Operational Feasibility

- Operational feasibility determines if the human resources are available to operate the system once it has been installed
- Users that do not want a new system may prevent it from becoming operationally feasible



Estimating Workloads

- Systems analysts formulate numbers that represent both current and projected workloads for the system so that any hardware obtained will possess the capability to handle current and future workloads

Comparisons of Workloads between Existing and Proposed Systems (Figure 3.4)

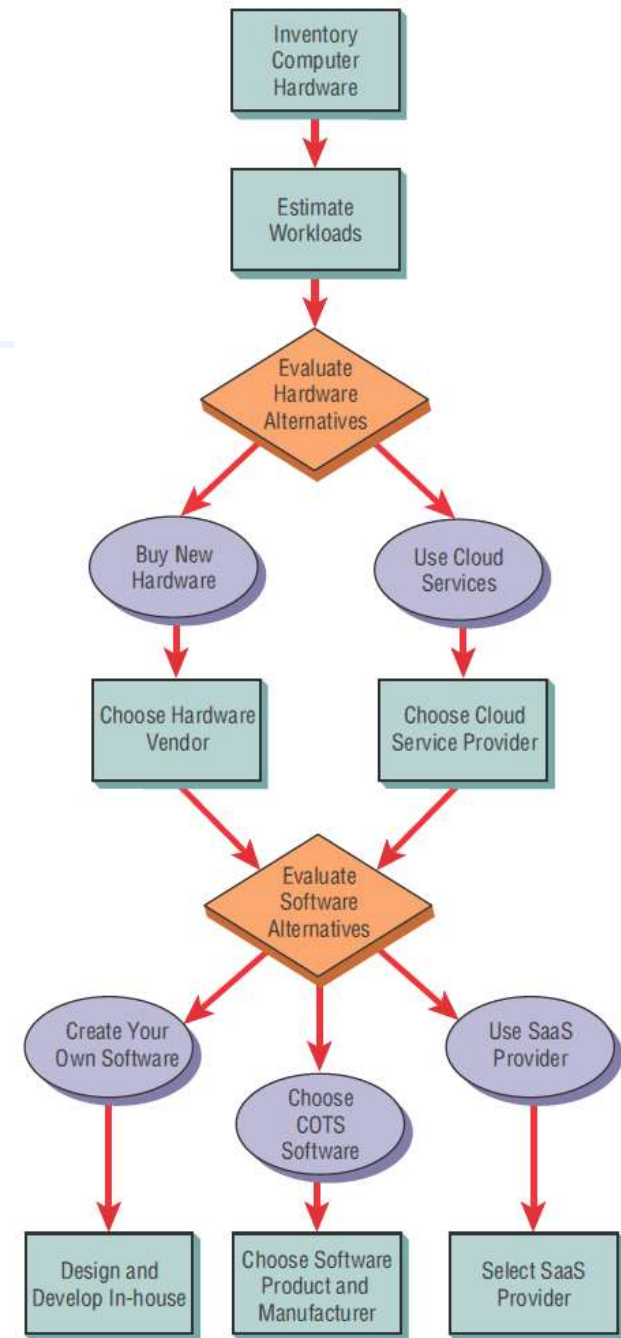
	Existing System	Proposed System
Task	Compare performance of distribution warehouses by running the summary program.	Compare performance of distribution warehouses on the Web-based dashboard.
Method	Computer programs are run when needed; processing is done from the workstation.	Updates occur immediately; processing is done online.
Personnel	Distribution manager	Distribution manager
When and how	Daily: Enter shipments on Excel spreadsheet; verify accuracy of spreadsheet manually; and then write files to backup media. Monthly: Run program that summarizes daily records and prints report; get report and make evaluations.	Daily: Enter shipments on the Web-based system using drop-down boxes. Data are automatically backed up to remote location. Monthly: Compare warehouses online using the performance dashboard; print only if needed.
Human time requirements	Daily: 20 minutes Monthly: 30 minutes	Daily: 10 minutes Monthly: 10 minutes
Computer time requirements	Daily: 20 minutes Monthly: 30 minutes	Daily: 10 minutes Monthly: 10 minutes



Ascertaining Hardware and Software Needs

- Steps used to determine hardware and software needs:
 - Inventory computer hardware currently available
 - Estimate current and future system workloads
 - Evaluate available hardware and software
 - Choose the vendor
 - Acquire the computer equipment

Steps in Choosing Hardware and Software (Figure 3.5)





Inventorying Computer Hardware

- Type of equipment
- Operation status of the equipment
- Estimated age of equipment
- Projected life of equipment
- Physical location of equipment
- Department or person responsible for equipment
- Financial arrangement for equipment



Evaluating Hardware

- Time required for average transactions
- Total volume capacity of the system
- Idle time of the CPU or network
- Size of memory provided



People that Evaluate Hardware

- Management
- Users
- Systems analysts



Acquisition of Computer Equipment

- Purchasing
- Using Cloud Services



Available cloud services

- Available cloud services may include:
 - Web hosting
 - Email hosting
 - Application hosting
 - Backup
 - Storage and processing of databases
 - Archiving
 - Ecommerce



Three Main Categories of Cloud Computing

- Software as a Service (SaaS)
- Infrastructure as a Service (IaaS)
- Platform as a Service (PaaS)



Strategic Cloud Computing Decisions

- Decisions on cloud computing can first be addressed on a strategic level
- Business should focus on:
 - Define a high-level business case that focuses on high-level benefits
 - Define core requirements
 - Define core technologies for the enterprise



Benefits of Cloud Computing

- Less time spent maintaining legacy systems
- May be simpler to acquire IT services
- Scalable applications that can grow by adding more cloud resources
- Consistency across multiple platforms
- Capital is not tied up



Drawbacks of Cloud Computing

- Loss of control of data stored in the cloud
- Potential security threats to data that is not stored on premises
- Reliability of the Internet as a platform

Purchasing or Using Cloud Services

Advantages and Disadvantages (Figure 3.6)

	Advantages	Disadvantages
Buying computer hardware	<ul style="list-style-type: none">• Full control over hardware and software• Often cheaper in long run• Provides tax advantages through depreciation	<ul style="list-style-type: none">• Initial cost is high• Risk of obsolescence• Risk of being stuck if choice was wrong• Full responsibility for operation and maintenance
Using cloud services	<ul style="list-style-type: none">• Maintenance and upgrades performed by provider• Ability to change software and hardware rapidly• Scalable—can grow quickly• Consistent over multiple platforms• No capital is tied up	<ul style="list-style-type: none">• Company doesn't control its own data• Data security is at risk• Reliability risks of the Internet platform• Proprietary APIs and software may make switching providers difficult



Evaluating Vendor Support

- Hardware support
- Software support
- Installation and training support
- Maintenance support

Guidelines for Vendor Selection (Figure 3.7)

Vendor Services	Specifics Vendors Typically Offer
Hardware Support	Full line of hardware Quality products Warranty
Software Support	Complete software needs Custom programming Warranty
Installation and Training	Commitment to schedule In-house training Technical assistance
Maintenance	Routine maintenance procedures Specified response time in emergencies Equipment loan while repair is being done
Cloud Services	Web hosting Email hosting Data storage
Software as a Service	Automatic software upgrades Support services Security and antivirus protection



BYOD and BYOT

- BYOD: Bring your own device
- BYOT: Bring your own technology
- Employee uses their own device access corporate networks, data, and services remotely



Benefits of BYOD and BYOT

- Building employee morale
- Potential for lowering the initial cost hardware purchase
- Facilitating remote, around-the-clock access to corporate computer networks
- Building on a familiar user interface to access corporate computing services, applications, databases, and storage



Drawbacks of BYOD and BYOT

- Security risks posed by untrained users
- Loss of the device
- Theft of the device and its data
- Unauthorized access to corporate networks using personal mobile devices



Software Alternatives

- Created custom software
- Purchased as COTS (commercial off-the-shelf) software
- Provided by an software as a service (SaaS)

Software Alternatives

(Figure 3.8)

	Advantages	Disadvantages
Creating Custom Software	<ul style="list-style-type: none"> • Specific response to specialized business needs • Innovation may give firm a competitive advantage • In-house staff available to maintain software • Pride of ownership 	<ul style="list-style-type: none"> • May be significantly higher initial cost compared to COTS software or ASP • Necessity of hiring or working with a development team • Ongoing maintenance
Purchasing COTS Packages	<ul style="list-style-type: none"> • Refined in the commercial world • Increased reliability • Increased functionality • Often lower initial cost • Already in use by other firms • Help and training comes with software 	<ul style="list-style-type: none"> • Programming focused; not business focused • Must live with the existing features • Limited customization • Uncertain financial future of vendor • Less ownership and commitment
Using SaaS	<ul style="list-style-type: none"> • Organizations that do not specialize in information systems can focus on what they do best (their strategic mission) • There is no need to hire, train, or retain a large IT staff • There is no expenditure of employee time on nonessential IT tasks 	<ul style="list-style-type: none"> • Loss of control of data, systems, IT employees, and schedules • Concern over the financial viability and long-run stability of the SaaS provider • Security, confidentiality, and privacy concerns • Loss of potential strategic corporate advantage regarding innovativeness of applications



Software Evaluation

- Performance effectiveness
- Performance efficiency
- Ease of use
- Flexibility
- Quality of documentation
- Manufacturer support

Guidelines for Evaluating Software (Figure 3.9)

Software Requirements	Specific Software Features
Performance Effectiveness	Able to perform all required tasks Able to perform all tasks desired Well-designed display screens Adequate capacity
Performance Efficiency	Fast response time Efficient input Efficient output Efficient storage of data Efficient backup
Ease of use	Satisfactory user interface Help menus available “Read Me” files for last-minute changes Flexible interface Adequate feedback Good error recovery
Flexibility	Options for input Options for output Usable with other software
Quality of Documentation	Good organization Adequate online tutorial Website with FAQ
Manufacturer Support	Technical support hotline Newsletter/email Website with downloadable product updates



Activity Planning and Control

- Planning includes:
 - Selecting a systems analysis team
 - Estimating time required to complete each task
 - Scheduling the project
- Control includes:
 - Comparing the plan for the project with its actual evolution
 - Taking appropriate action to expedite or reschedule activities



Identifying and Forecasting Costs and Benefits

- Judgment methods
 - Estimates from the sales force
 - Surveys to estimate customer demand
 - Delphi studies
 - Creating scenarios
 - Drawing historical analogies



Identifying and Forecasting Costs and Benefits (continued)

- If historical data are available
 - Conditional:
 - There is an association among variables in the model
 - Unconditional:
 - Do not need to find or identify any relationships



Estimation of Trends

- Graphical judgment
- Moving averages



Identifying Benefits and Costs

- Tangible benefits are advantages measurable in dollars through the use of the information system
- Intangible benefits are difficult to measure
- Tangible costs are accurately projected by the systems analyst and accounting personnel
- Intangible costs are difficult to estimate and may not be known



Tangible Benefits

- Advantages measurable in dollars that accrue to the organization through the use of the information system
- Examples:
 - Increase in the speed of processing
 - Access to otherwise inaccessible information
 - Access to information on a more timely basis
 - The advantage of the computer's superior calculating power
 - Decreases in the amount of employee time needed to complete specific tasks



Intangible Benefits

- Intangible benefits are benefits from use of the information system that are difficult to measure
- Examples:
 - Improving the decision-making process
 - Enhancing accuracy
 - Becoming more competitive in customer service
 - Maintaining a good business image
 - Increasing job satisfaction



Tangible Costs

- Those that can be accurately projected by systems analysts and the business' accounting personnel
- Examples:
 - Cost of equipment
 - Cost of resources
 - Cost of systems analysts' time
 - Cost of programmers' time
 - Employees' salaries



Intangible Costs

- Those that are difficult to estimate and may not be known
- Examples:
 - Losing a competitive edge
 - Losing the reputation of being first
 - Declining company image
 - Ineffective decision making



Comparing Costs and Benefits

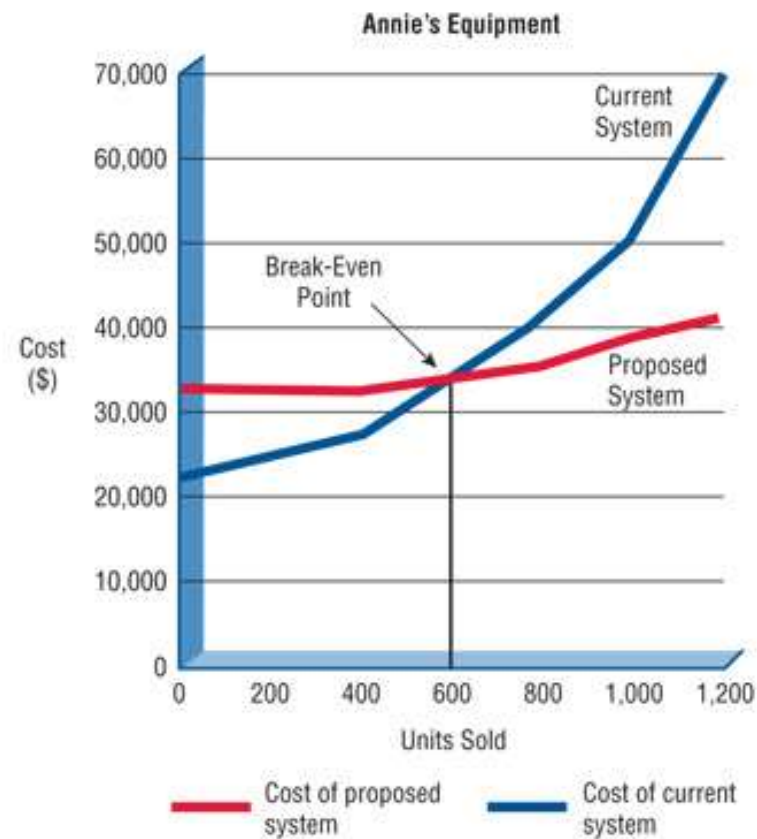
- Break-even analysis
- Payback
- Cash-flow analysis
- Present value analysis



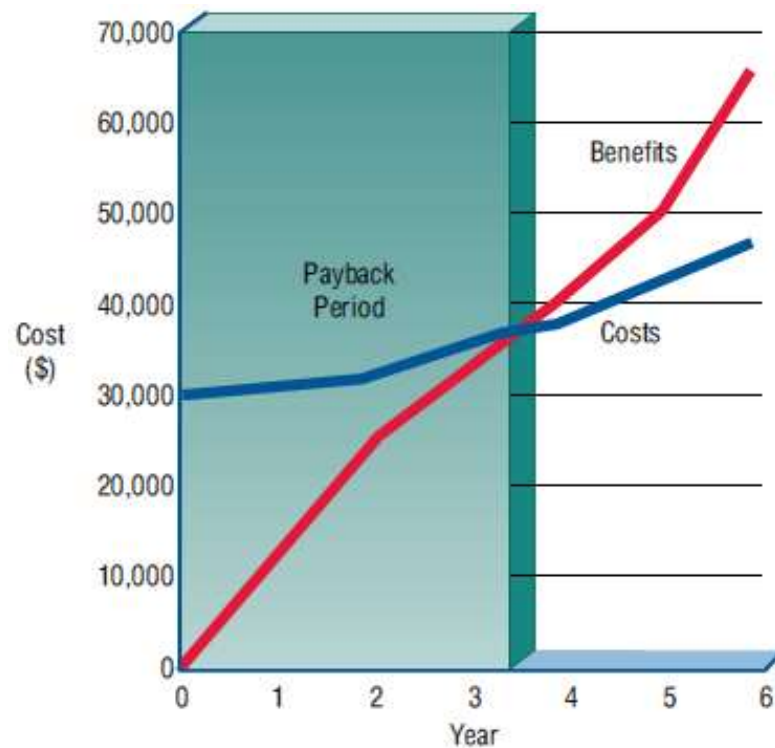
Break-Even Analysis

- The point at which the total cost of the current system and the proposed system intersect
- Useful when a business is growing and volume is a key variable in costs
- Disadvantage:
 - Benefits are assumed to remain the same
- Advantage:
 - Can determine how long it will take for the benefits of the system to pay back the costs of developing it

Break-Even Analysis (Figure 3.10)



Break-Even Analysis Showing a Payback Period of Three and a Half Years (Figure 3.11)



— Cumulative benefits from proposed system
— Cumulative costs of proposed system

Year	Cost (\$)	Cumulative Costs (\$)	Benefits (\$)	Cumulative Benefits (\$)
0	30,000	30,000	0	0
1	1,000	31,000	12,000	12,000
2	2,000	33,000	12,000	24,000
3	2,000	35,000	8,000	32,000
4	3,000	38,000	8,000	40,000
5	4,000	42,000	10,000	50,000
6	4,000	46,000	15,000	65,000



Cash-Flow Analysis

- Examines the direction, size, and pattern of cash flow that is associated with the proposed information system
- Determines when cash outlays and revenues will occur for both; not only for the initial purchase, but over the life of the information system

Cash-Flow Analysis for the Computerized Mail-Addressing System (Figure 3.12)

	Year 1				Year 2
	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1
Revenue	\$5,000	\$20,000	\$24,960	\$31,270	\$39,020
Costs					
Software development	10,000	5,000			
Personnel	8,000	8,400	8,800	9,260	9,700
Training	3,000	6,000			
Equipment lease	4,000	4,000	4,000	4,000	4,000
Supplies	1,000	2,000	2,370	2,990	3,730
Maintenance	0	2,000	2,200	2,420	2,660
Total Costs	26,000	27,400	17,370	18,670	20,090
Cash Flow	-21,000	-7,400	7,590	12,600	18,930
Cumulative Cash Flow	-21,000	-28,400	-20,810	-8,210	10,720



Present Value Analysis

- Way to assess all the economic outlays and revenues of the information system over its economic life, and to compare costs today with future costs and today's benefits with future benefits
- Presents the time value of the investment in the information system as well as the cash flow

Present Value Analysis (Figure 3.14)

- Taking into account present value, the conclusion is that the costs are greater than the benefits.
- The discount rate, i , is assumed to be .12 in calculating the multipliers in this table.

	Year						
	1	2	3	4	5	6	Total
Costs	\$40,000	42,000	44,100	46,300	48,600	51,000	
Multiplier	.89	.80	.71	.64	.57	.51	
Present Value of Costs	35,600	33,600	31,311	29,632	27,702	26,010	183,855
Benefits	\$25,000	31,200	39,000	48,700	60,800	76,000	
Multiplier	.89	.80	.71	.64	.57	.51	
Present Value of Benefits	22,250	24,960	27,690	31,168	34,656	38,760	179,484



Guidelines for Analysis

- Use break-even analysis if the project needs to be justified in terms of cost, not benefits
- Use payback when the improved tangible benefits form a convincing argument for the proposed system
- Use cash-flow analysis when the project is expensive, relative to the size of the company
- Use present value when the payback period is long or when the cost of borrowing money is high



Work Breakdown Structure

- Often a project needs to be broken down into smaller tasks or activities
- These tasks together make up a work breakdown structure (WBS)



Work Breakdown Structure Properties

- Each task or activity contains one deliverable, or tangible outcome, from the activity
- Each task can be assigned to a single individual or a single group
- Each task has a responsible person monitoring and controlling performance



Developing a WBS

- Decomposition, starting with large ideas, then breaking them down into manageable activities
- Product oriented, building a website can be broken down into many parts
- Process-oriented, emphasizes the importance of each phase



Time Estimation Techniques

- Relying on experience
- Using analogies
- Using three-point estimation
- Identifying function points
- Using time estimation software



Function Point Analysis

- Takes the five main components of a computer system and rates them in terms of complexity:
 - External inputs
 - External outputs
 - External queries
 - Internal logical files
 - External interface files

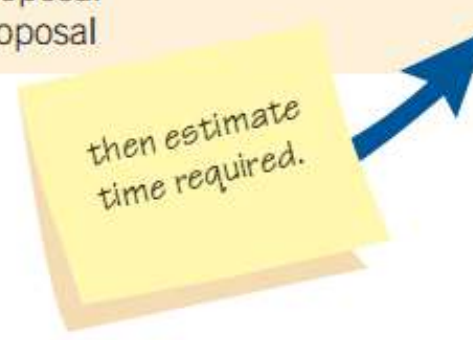
Beginning to Plan a Project by Breaking it into Three Major Activities (Figure 3.16)

Phase	Activity
Analysis	Data gathering Data flow and decision analysis Proposal preparation
Design	Data entry design Input design Output design Data organization
Implementation	Implementation Evaluation

Break apart
the major
activities into
smaller ones.

Refining the Planning and Scheduling of Analysis Activities by Adding Detailed Tasks and Establishing the Time Required to Complete the Tasks (Figure 3.17)

Activity	Detailed Activity	Weeks Required
Data gathering	Conduct interviews	3
	Administer questionnaires	4
	Read company reports	4
	Introduce prototype	5
	Observe reactions to prototype	3
Data flow and decision analysis	Analyze data flow	8
Proposal preparation	Perform cost-benefit analysis	3
	Prepare proposal	2
	Present proposal	2

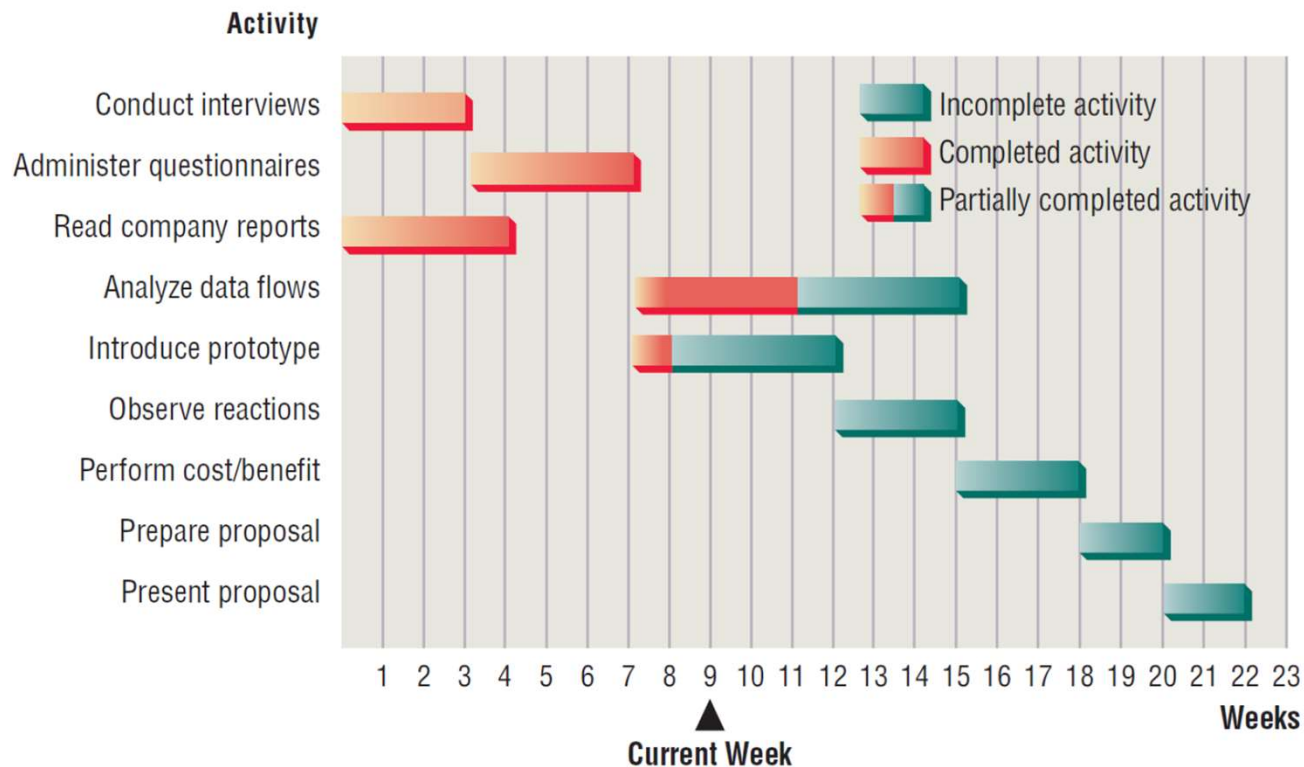




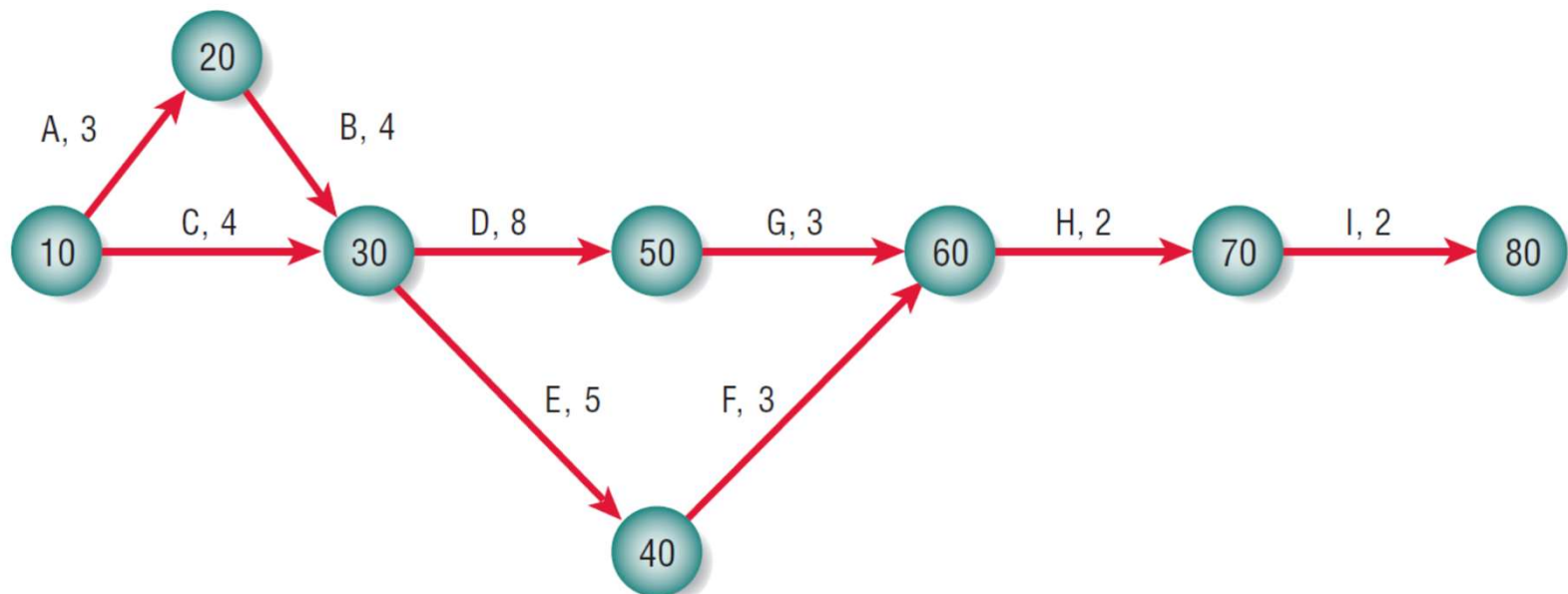
Project Scheduling

- Gantt Charts
 - Simple
 - Lends itself to end user communication
 - Drawn to scale
- PERT diagrams
 - Useful when activities can be done in parallel

Using a Two-Dimensional Gantt Chart for Planning Activities that Can Be Accomplished in Parallel (Figure 3.18)



A Completed PERT Diagram for the Analysis Phase of a Systems Project (Figure 3.22)





PERT Diagram Advantages

- Easy identification of the order of precedence
- Easy identification of the critical path and thus critical activities
- Easy determination of slack time



Project Due Dates

- Estimating models
 - Costar
 - Construx
- Function point analysis
 - Helps the analyst quantitatively estimate the overall length of software development efforts



Estimating Costs

- Using a work breakdown structure
 - Estimate costs for each activity in the work breakdown structure
 - Prepare a budget for the project and have it approved by the organization or client
 - Manage and control the costs throughout the project



Approaches to Cost Estimation

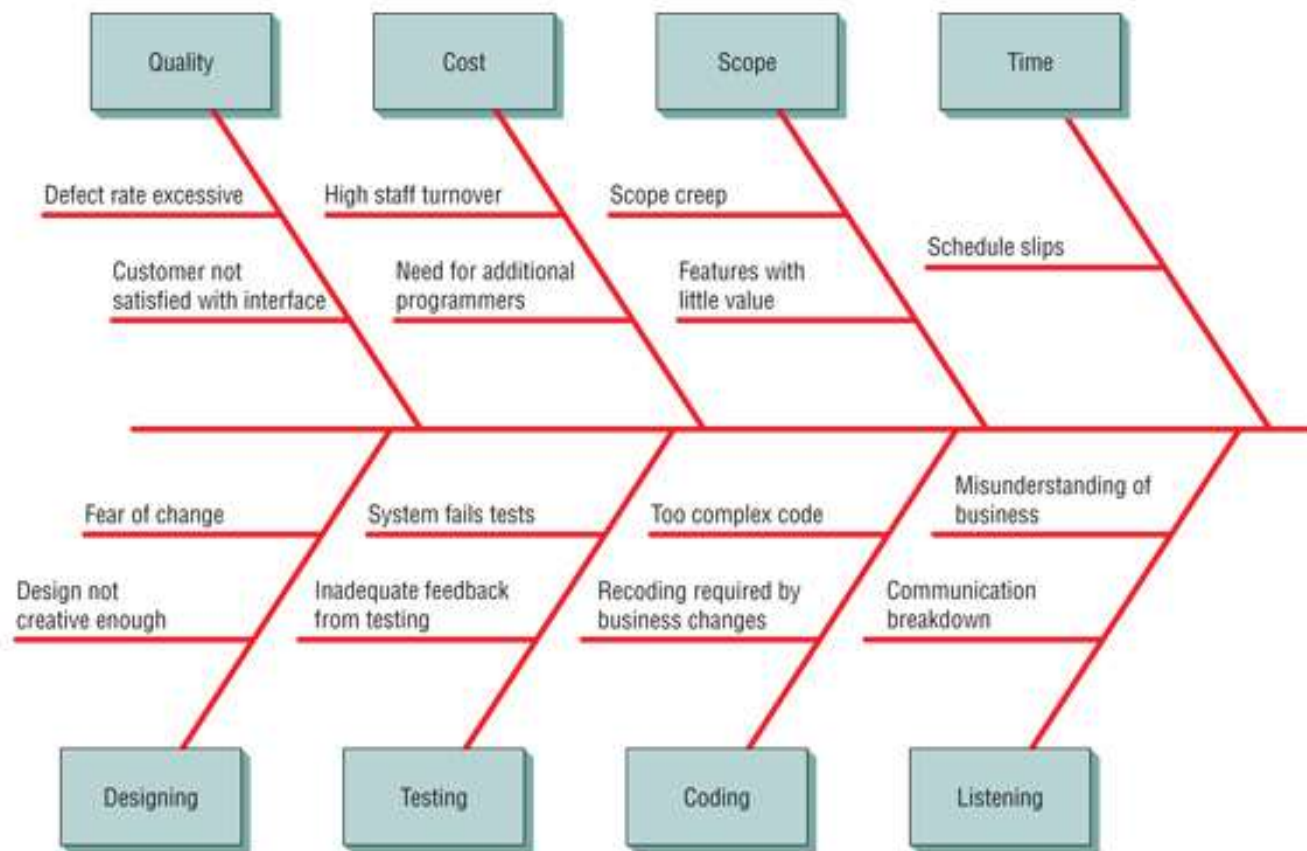
- Basing estimates on similar projects, also called the top-down approach
- Building bottom-up estimates
- Using parametric modeling



Project Risk

- Project failures may be prevented by:
 - Training
 - Experience
 - Learning why other projects have failed
- Fishbone diagram systematically lists all of the possible problems that can occur

Fishbone Diagram (Figure 3.24)





Expediting

- Expediting is speeding up a process
- Expediting can help reduce the time it takes to complete an entire project
- The expedited activities have to be on the critical path

Expediting to minimize project time

Activity Chosen	Time for each path 22 19 19 16	Cost	Cumulative Cost
B	21 18 19 16	\$500	\$500
B	20 17 19 16	\$500	\$1,000
I	19 16 18 15	\$600	\$1,600
A	18 15 18 15	\$800	\$2,400
D	17 15 17 15	\$1,000	\$3,400
D	16 15 16 15	\$1,000	\$4,400
A	15 14 16 15	\$800	\$5,200
C	15 14 15 14	\$400	\$5,600
C	15 14 14 13	\$400	\$6,000



Earned Value Management (EVM)

- A technique used to help determine progress (or setbacks) on a project
- Involves:
 - Project cost
 - Project schedule
 - Performance of the project team



Four Key Measures in EVM

- Budget at completion (BAC) is the total budget for the project
- Planned value (PV) is the value of the work that is to be completed on the project
- Actual Cost (AC) is the total cost incurred in completing the work
- Earned value (EV) is an estimate of the value of work completed (where p is percentage completed)

$$EV = PV * p$$



Monitoring Completion

- The Cost Performance Index (CPI), Earned Value (EV), and BAC are used to estimate how much more is needed to complete the project (ETC):

$$ETC = (BAC - EV) / CPI$$

- The Actual Cost (AC) and the ETC are used to estimate the completion cost (EAC):

$$EAC = AC + ETC$$



Managing the Team Project

- Team management
 - Assembling a team
 - Team communication strategies
 - Project productivity goals
 - Team member motivation



Assembling a Team

- Shared value of team work
- Good work ethic
- Honesty
- Competency
- Readiness to take on leadership based on expertise
- Motivation
- Enthusiasm for the project
- Trust of teammates



Communication Strategies

- Teams often have two leaders:
 - Task leader: leads members to accomplish tasks
 - Socioemotional leader: concerned with social relationships
- The systems analyst must manage:
 - Team members
 - Their activities
 - Their time and resources



Project Productivity Goals and Motivation

- Successful projects require that reasonable productivity goals for tangible outputs and process activities be set.
- Goal-setting helps to motivate team members.



Ecommerce Project Management

- Ecommerce and traditional software project management differences:
 - The data used by ecommerce systems is scattered across the organization
 - Ecommerce systems need a staff with a wide variety of skills
 - Partnerships must be built externally and internally well ahead of implementation
 - Security is of utmost importance



Project Charter

- Describes in a written document what the expected results of the systems project are and the time frame for delivery



Project Charter Clarifies These Questions

- What does the user expect of the project?
- What is the scope of the project?
- What analysis methods will the analyst use to interact with users?
- Who are the key participants?
- What are the project deliverables?
- Who will evaluate the system and how will they evaluate it?
- What is the estimated project timeline?
- Who will train the users?
- Who will maintain the system?



The Systems Proposal

- Cover letter
- Title page of project
- Table of contents
- Executive summary
- Outline of systems study with appropriate documentation
- Detailed results of the systems study
- Systems alternatives
- Systems analysts recommendations
- Summary
- Appendices



Using Figures for Effective Communication

- Effective use of tables
- Effective use of graphs



Effective Use of Tables

- Integrate into the body of the proposal
- Try to fit the entire table vertically on a single page.
- Number and title the table at the top of the page.
- Label each row and column.
- Use a boxed table if room permits.
- Use footnotes if necessary to explain detailed information contained in the table.



Effective Use of Graphs

- Choose a style of graph that communicates your intended meaning well
- Integrate the graph into the body of the proposal
- Give the graph a sequential figure number and a meaningful title
- Label each axis, and any lines, columns, bars, or pieces of the pie on the graph
- Include a key to indicate differently colored lines, shaded bars, or crosshatched areas



Summary

- Project management fundamentals
 - Project initiation
 - Determining project feasibility
 - Activity planning and control
 - Project scheduling
 - Managing systems analysis team members
- Problem definition
 - Issues of the present system
 - The objective for each issue
 - The requirements that must be included in all proposed systems



Summary (continued)

- Project selection
 - Backed by management
 - Commitment of resources
 - Attains goals
 - Practical
 - Important
- Feasibility
 - Operational
 - Technical
 - Economic



Summary (continued)

- Acquiring hardware and software
- Work breakdown structure
- Project planning
 - Gantt charts
 - PERT
 - Function point analysis
- Team management
- Ecommerce projects
- Preparing a system proposal