

# Project Management

## Chapter 4

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### Systems Analysis and Design

# Learning Objectives

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- Understand how projects are initiated and selected
- Define a business problem and determine the feasibility of a proposed project
- Plan a project by identifying activities and scheduling them
- Understand how an alternative approach called agile development balances objectives to manage the analysis and design process
- Manage team members and analysis and design activities so the project objectives are met while the project remains on schedule

# Project Management Fundamentals

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

# Major Topics

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

# Project Initiation

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

## **Figure 3.1** Checking output, observing employee behavior, and listening to feedback are all ways to help the analyst pinpoint systems problems and opportunities

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

# Problem Definition

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- 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

# Problem Definition Steps

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- 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

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- 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

# Determining Feasibility

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

# Defining Objectives

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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

# Feasibility Impact Grid (FIG)

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- A feasibility impact grid (FIG) is used to assess the impact of any improvements to the existing system
- It can increase awareness of the impacts made on the achievement of corporate objectives

**Figure 3.3** An analyst can use a feasibility impact grid to show how each system component affects process objectives

	System Components	Process Objectives						
		Speeding Up a Process	Streamlining a Process	Combining Processes	Reducing Errors in Input	Reducing Redundant Data Storage	Reducing Redundant Output	Improving Integration of Systems
Ecommerce Systems	Online catalog	✓	✓				✓	✓
	Online order processing	✓	✓		✓	✓		✓
	Online technical support		✓					
	Banner advertisements							
	Web-based intelligent push agent							
MIS	Inventory management		✓					✓
	Production scheduling		✓					✓
	Monthly sales reports				✓			✓
	Regional sales analysis				✓			✓
	Logistics management					✓		✓
TPS	Payroll	✓	✓	✓	✓	✓	✓	✓
	Order processing	✓	✓	✓	✓	✓	✓	✓
	Order tracking	✓	✓	✓	✓	✓	✓	✓
	Accounts payable	✓			✓	✓	✓	✓
	Accounts receivable	✓	✓	✓	✓	✓	✓	✓

**Symbol**

**Meaning**



Proposed information system component or improvement can contribute positively to the process objective when implemented in the future.



Existing information system component is contributing positively to the process objective.

**Figure 3.4** An analyst can use a feasibility impact grid to show how each system component affects corporate objectives

	System Components	Corporate Objectives						
		Corporate Profits	Competitive Strategy	Cooperative Ventures	Internal Operations Support	Internal Decision Support	Customer Service	Employee Morale
Ecommerce Systems	Online catalog		✓				✓	✓
	Online order processing		✓	✓			✓	✓
	Online technical support		✓				✓	✓
	Banner advertisements	✓		✓			✓	
	Web-based intelligent push agent						✓	
MIS	Inventory management	✓	✓		✓	✓	✓	
	Production scheduling	✓	✓		✓	✓	✓	✓
	Monthly sales reports	✓	✓		✓	✓		✓
	Regional sales analysis	✓			✓	✓		✓
	Logistics management	✓	✓		✓	✓		
TPS	Payroll				✓			✓
	Order processing	✓			✓		✓	
	Order tracking	✓			✓		✓	
	Accounts payable			✓	✓		✓	
	Accounts receivable			✓	✓		✓	

**Symbol**      **Meaning**

✓ Proposed information system component or improvement can contribute positively to the corporate objective when implemented in the future.

✓ Existing information system component is contributing positively to the corporate objective.

## Figure 3.5 The three key elements of feasibility include technical, economic, and operational feasibility

The Three Key Elements of Feasibility	
Technical Feasibility	<ul style="list-style-type: none"><li>Add on to present system</li><li>Technology available to meet users' needs</li></ul>
Economic Feasibility	<ul style="list-style-type: none"><li>Systems analysts' time</li><li>Cost of systems study</li><li>Cost of employees' time for study</li><li>Estimated cost of hardware</li><li>Cost of packaged software or software development</li></ul>
Operational Feasibility	<ul style="list-style-type: none"><li>Whether the system will operate when installed</li><li>Whether the system will be used</li></ul>



# Technical Feasibility

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- 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

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- 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

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- 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

# Activity Planning And Control

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- 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

# Estimating Time

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- Project is broken down into phases
- Further project is broken down into tasks or activities
- Finally project is broken down into steps or even smaller units
- Time is estimated for each task or activity
- Most likely, pessimistic, and optimistic estimates for time may be used

## Figure 3.6 Beginning to plan a project by breaking it into three major activities

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



Break apart  
the major  
activities into  
smaller ones.

**Figure 3.7** Refining the planning and scheduling of analysis activities by adding detailed tasks and establishing the time required to complete the tasks

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

Break these down further,

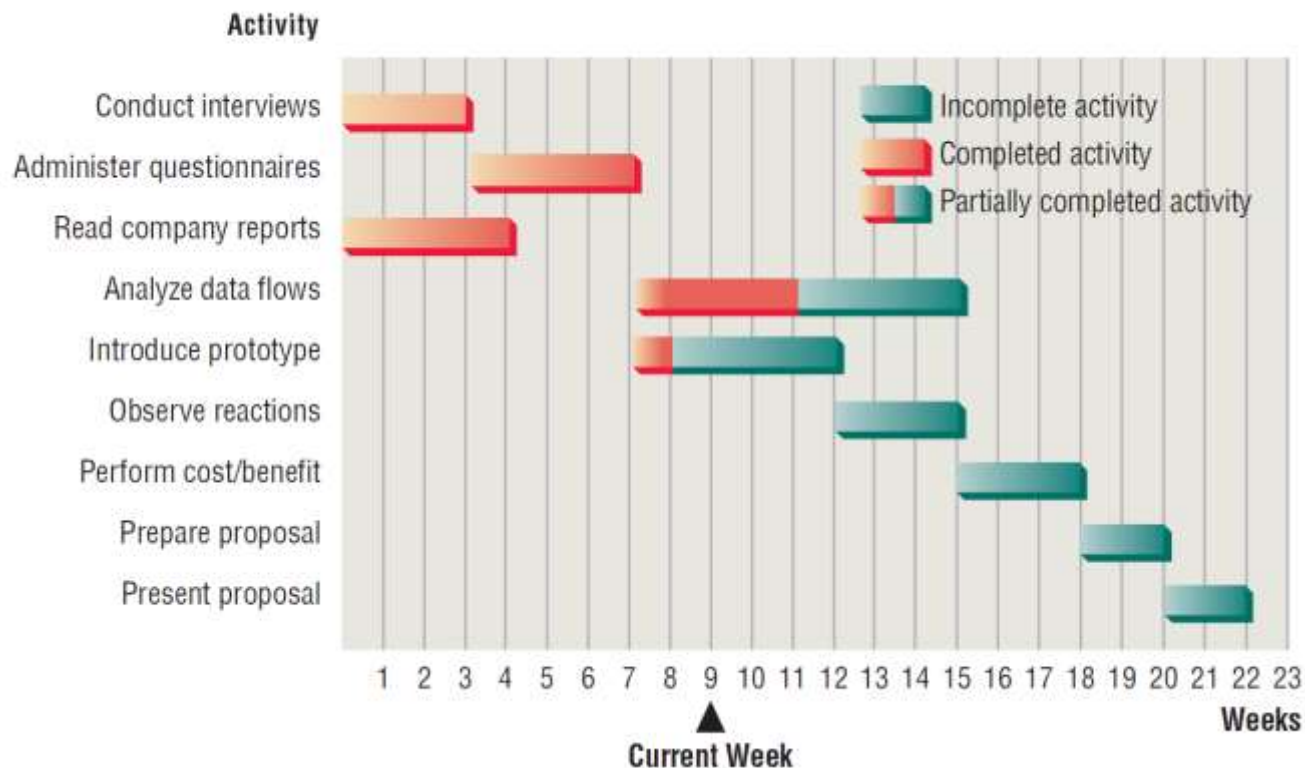
then estimate time required.

# Project Scheduling

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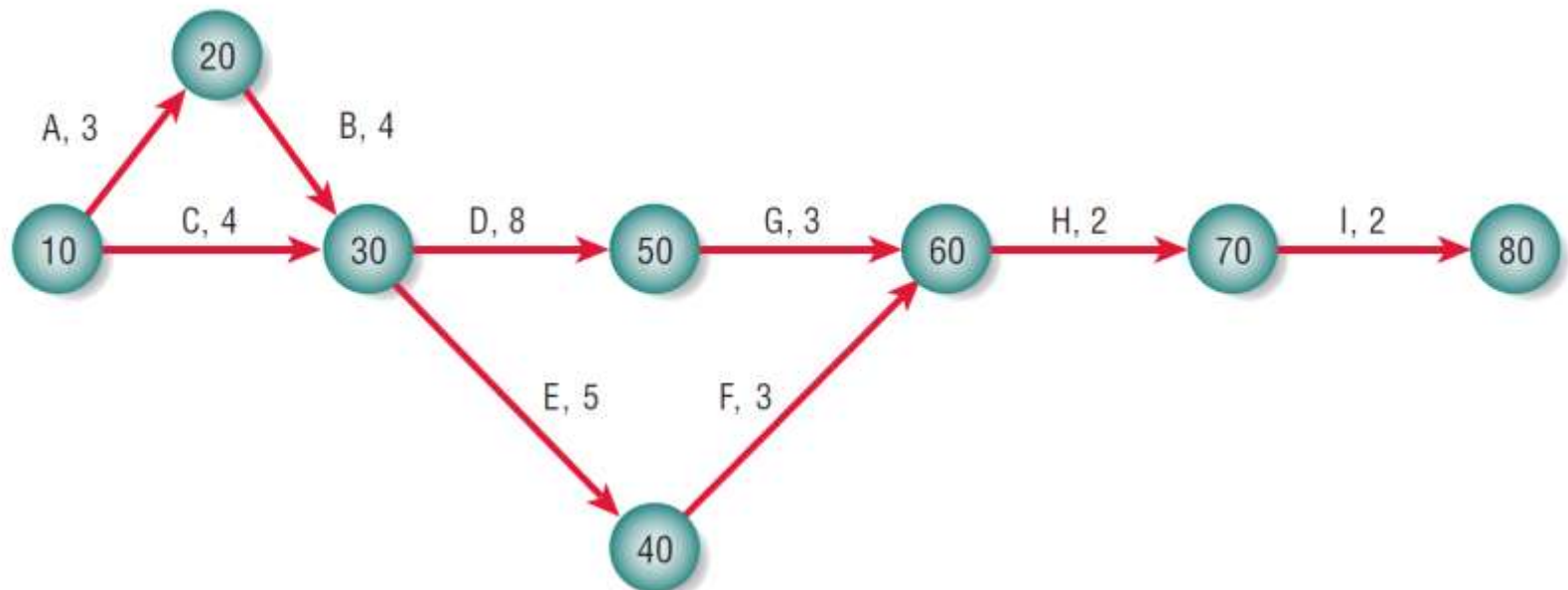
- Gantt Charts
  - Simple
  - Lends itself to end user communication
  - Drawn to scale
- PERT diagrams
  - Useful when activities can be done in parallel

## Figure 3.8 Using a two-dimensional Gantt chart for planning activities that can be accomplished in parallel





## Figure 3.12 A completed PERT diagram for the analysis phase of a systems project



# PERT Diagram Advantages

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

# Timeboxing

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- Timeboxing sets an absolute due date for project delivery
- The most critical features are developed first and implemented by the due date
- Other features are added later

# Project Due Dates

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

# Function Point Analysis

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- Count components
- Rate each component's complexity
- Assign complexity numbers
- Arrive at a subtotal
- Multiply by adjustment factor

# Based on Five Main Components of Computer Systems

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- External inputs
- External outputs
- External queries
- Internal logical files
- External interface files

# Figure 3.15 Function point counts can be accomplished in five steps

**STEP 1:** Look up low, average, and high values for external inputs, external outputs, and external queries.

File Types Referenced	Number of Data Elements Included		
0	1-5	6-20	21+
1-3	Low	Low	Average
4+	Low	Average	High
	Average	High	High

**STEP 2:** Look up low, average and high values for internal logical files and external interface files.

Group of Elements	Number of Data Elements Included		
0-1	1-19	20-50	51+
2-5	Low	Low	Average
6+	Low	Average	High
	Average	High	High

**STEP 3:** Calculate the number of unadjusted functions points (UFP) using predetermined weights. (The weights are the numbers in blue after the × sign.)

Type of Component	Number of Components	Low	Average	High	Total
External inputs	5 (2, 1, 2)	2 × 3	1 × 4	2 × 5	22
External outputs	12 (4, 6, 2)	4 × 4	6 × 5	2 × 7	60
External queries	20 (5, 10, 5)	5 × 3	10 × 4	5 × 6	85
Internal logical files	13 (3, 5, 5)	3 × 7	5 × 10	5 × 15	146
External interface files	2 (1, 0, 1)	1 × 5	0 × 7	1 × 10	15
<b>Total unadjusted function points</b>					<b>328</b>

**STEP 4:** Determine the value adjustment factor (VAF) by rating each system characteristic and calculating a subtotal, then dividing it by 100.

System Characteristic (Rate 0 for no effect; 5 for strong effect)	Rating
Data communications	2
Distributed data processing	2
Performance	0
Heavily used configuration	0
Transaction rate	0
Online data entry	0
End user efficiency	0
Online update	0
Complex processing	0
Reusability	2
Installation ease	3
Operational ease	3
Multiple sites	3
Facilitate change	1
<b>VAF = Total divided by 100 = 16/100 = 0.16</b>	

**STEP 5:** Calculate the number of adjusted function points using the following formula:

$$FPC = UFP \times (0.65 + VAF) = 328 \times (0.65 + 0.16) = 328 \times 0.81 = 266$$

# Staffing Requirements

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- Choice of software can influence the amount of effort that goes into system development
- It is not true that the more people assigned to a task, the faster it will get done



# Managing Risk

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- 30 percent of all projects succeed
- 20 percent fail
- 50 percent finish, but are either late, over budget, or offer fewer features than originally promised

## Figure 3.16 Calculating the extra time required to ensure that a project is completed on time

Potential Problem That May Risk Completion of the Entire Project	Problem Probability	Delay if Problem Occurs	Budgeted Delay
Team is delayed because they are finishing another project.	0.50	60 days	30 days
Executives are not present during requirements phase.	0.25	20 days	5 days
Time budgeted to compensate delays to the project			35 days

# Managing Analysis and Design Activities

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

# Assembling a Team

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- 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

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

# Project Productivity Goals and Motivation

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- 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

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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 Failures

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- Project failures may be prevented by:
  - Training
  - Experience
  - Learning why other projects have failed
- Project charter
  - Describes in a written document what the expected results of the systems project are and the time frame for delivery



# Agile Development

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An innovative philosophy and methodology comprised of systems development practices, techniques, values, and principles intended for use in developing systems in a dynamic way

## **Figure 3.17** The analyst can control the time, cost, quality, and scope of the project to balance the activities

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Use These Four Control Variables	To Balance These Four Activities
<ul style="list-style-type: none"><li>• Time</li><li>• Cost</li><li>• Quality</li><li>• Scope</li></ul>	<ul style="list-style-type: none"><li>• Coding</li><li>• Testing</li><li>• Listening</li><li>• Designing</li></ul>

# Agile Core Practices and Roles of the Agile Approach

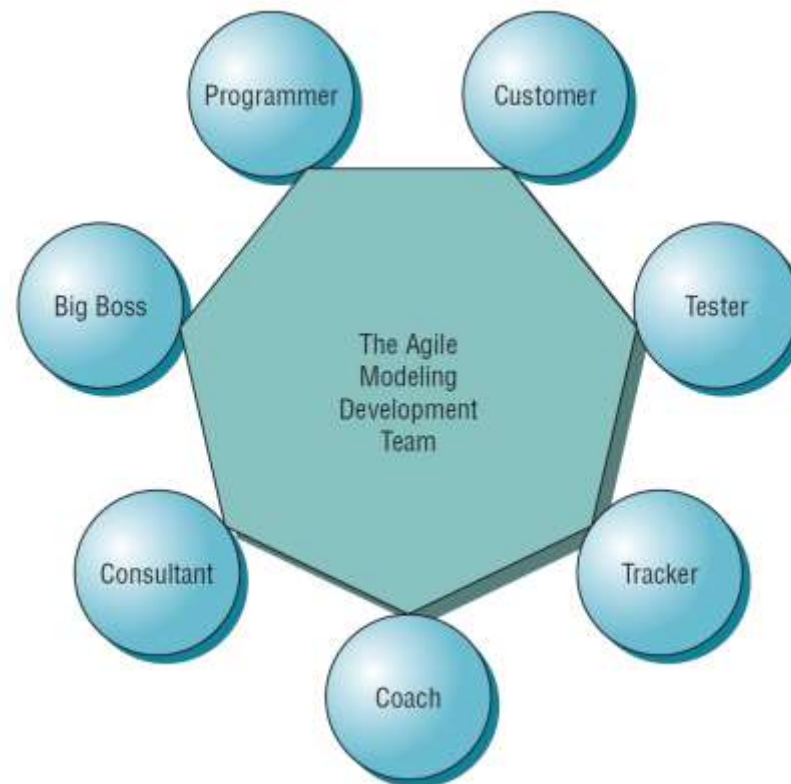
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There are four Agile practices:

- A short release time
- Working a 40-hour week
- Having an onsite customer
- Pair programming

**Figure 3.19** Roles in the Agile Development process include members from inside of the development team as well as at least one onsite customer

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# The Planning Game

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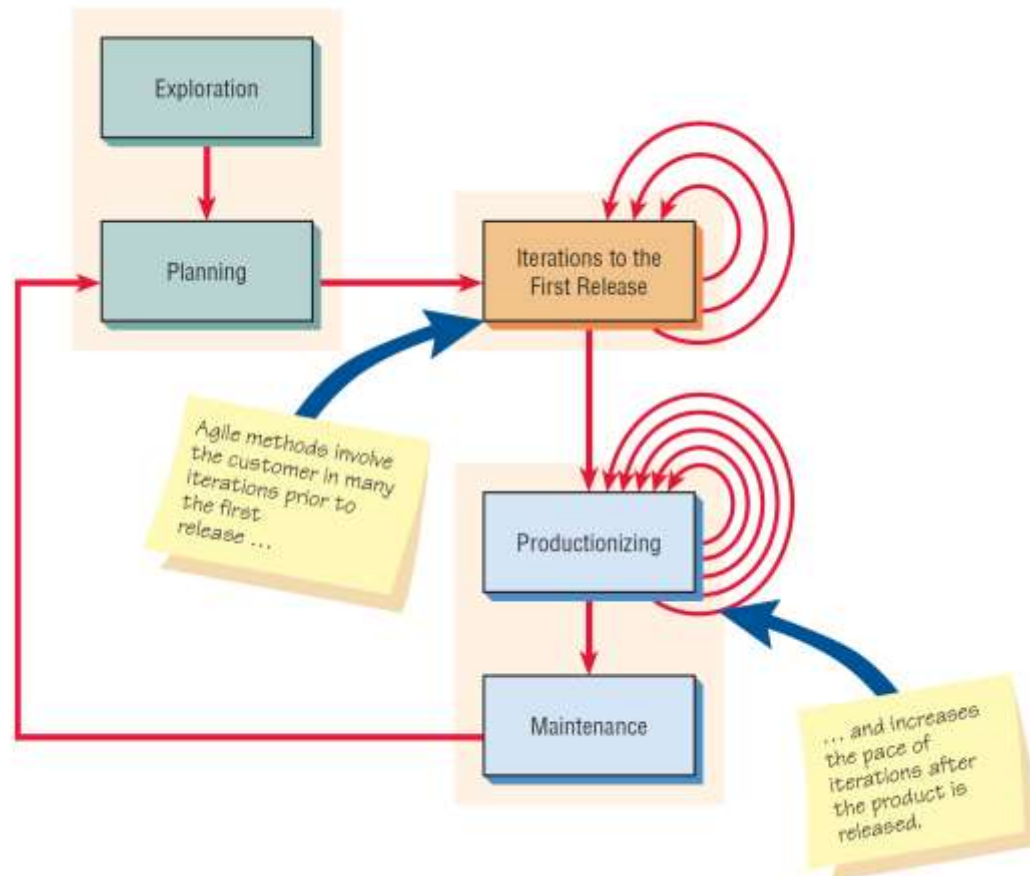
- The planning game defines rules to help formulate the development team and customer relationship
- Limits uncertainty
- Two players: the development team and the business customer
- Customers decide what to tackle first

# Development Process for an Agile Project

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- Agile projects are interactive and incremental
- The five Stages of Agile development are:
  - Exploration
  - Planning
  - Iterations to the first release
  - Productionizing
  - Maintenance

**Figure 3.21** The five stages of the agile modeling development process show that frequent iterations are essential to successful system development



# Summary

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- 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)

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

# Summary (Continued)

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- Project planning
  - Gantt charts
  - PERT
  - Function point analysis
- Team management
- Ecommerce projects
- The Agile approach