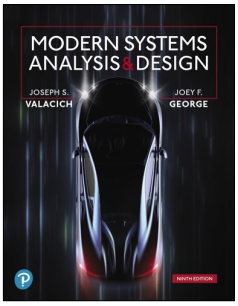
Modern Systems Analysis and Design

Ninth Edition



Chapter 6

Determining System Requirements

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Learning Objectives

6.1 Describe options for designing and conducting interviews and developing a plan for conducting an interview to determine system requirements

6.2 Explain the advantages and pitfalls of observing workers and analyzing business documents to determine system requirements

6.3 Explain how computing can provide support for requirements determination

6.4 Participate in and help plan a Joint Application Design session

6.5 Use prototyping during requirements determination

6.6 Describe contemporary approaches to requirements determination

6.7 Understand how requirements determination techniques determination techniques apply to the development of electronic commerce applications

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Introduction

- Analysis has two subphases:
  - Requirements determination
  - Requirements structuring

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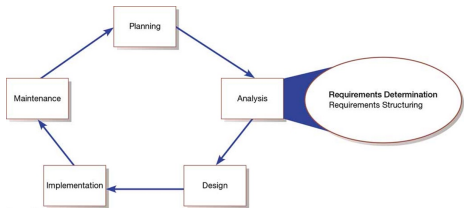
Figure 6-1: System Development Life Cycle with Analysis Phase Highlighted



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The Process of Determining Requirements

6.1 Describe options for designing and conducting interviews and developing a plan for conducting an interview to determine system requirements

- Characteristics of a good systems analyst:
  - Impertinence – question everything
  - Impartiality – consider all issues to find the best solution
  - Relax constraints – assume anything is possible and eliminate the infeasible
  - Attention to detail – every fact must fit with every other fact
  - Reframing – challenge yourself to look at the organization in new ways

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Organizational Components to Understand

6.1 Describe options for designing and conducting interviews and developing a plan for conducting an interview to determine system requirements

- Systems analysts need to understand:
  - Business objectives that drive what and how work is done
  - Information people need to do their jobs
  - The data (definition, volume, size) handled in support of jobs
  - Data transformation and storage (when, how, by whom)
  - Data handling dependencies and sequences
  - Data handling and processing rules
  - Policies and guidelines that describe the nature of the business and market and the environment it operates in
  - Key events that affect data values and when they occur

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Table 6-1: Deliverables for Requirements Determination

Deliverables for Requirements Determination
1. Information collected from conversations with or observations of users: interview transcripts, notes from observation, meeting minutes
2. Existing written information business mission and strategy statements, sample business forms and reports and computer displays, procedure manuals, job descriptions, training manuals, flowcharts and documentation of existing systems, consultant reports
3. Computer-based information: results from JAD sessions, reports of existing systems, and displays and reports from system prototypes

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Table 6-2: Traditional Methods of Collecting System Requirements

Traditional Methods of Collecting System Requirements
• Individually interview people informed about the operation and issues of the current system and future systems needs
• Interview groups of people with diverse needs to find synergies and contrasts among system requirements
• Observe workers at selected times to see how data are handled and what information people need to do their jobs
• Study business documents to discover reported issues, policies, rules, and directions as well as concrete examples of the use of data and information in the organization

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Figure 6-3: Guidelines for Effective Interviewing

Guidelines for Effective Interviewing
Plan the Interview • Prepare interviewee: appointment, priming questions • Prepare checklist, agenda, and questions
Listen carefully and take notes (record if permitted)
Review noes within 48 hours of interview
Seek diverse views

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Interviewing and Listening

6.1 Describe options for designing and conducting interviews and developing a plan for conducting an interview to determine system requirements

- **Open-ended questions** – questions in interviews that have no prespecified answers
- **Closed-ended questions** – questions in interviews that ask those responding to choose from among a set of specified responses

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Figure 6-2: Typical Interview Guide


Interview Outline

Interviewee: *Name of person being interviewed*	Interviewer: *Name of person leading interview*
Location/Medium: *Office, conference room, or phone number*	Appointment Date: Start Time: End Time:
Objectives: *What data to collect* *On what to gain agreement* *What areas to explore*	Reminders: *Background/experience of interviewee* *Known opinions of interviewee*
Agenda:	Approximate Time:
Introduction	1 minute
Background on Project	2 minutes
Overview of Interview	
Topics to Be Covered	1 minute
Permission to Record	
Topic 1 Questions	5 minutes
Topic 2 Questions	7 minutes
…	…
Summary of Major Points	2 minutes
Questions from Interviewee	5 minutes
Closing	1 minute

General Observations:
Interviewee seemed busy probably need to call in a few days for follow-up questions because he gave only short answers. PC was turned off—probably not a regular PC user.

Unresolved Issues, Topics Not Covered:
He needs to look up sales figures from 1999. He raised the issue of how to handle returned goods, but we did not have time to discuss.

Interviewee:	Date:
Questions:	Notes:
When to ask question, if conditional *Question: 1* Have you used the current sales tracking system? If so, how often?	*Answer* Yes, I ask for a report on my product line weekly. *Observations* Seemed anxious — may be overestimating usage frequency.
If yes, go to Question 2	
Question: 2 What do you like least about the system?	*Answer* Sales are shown in units, not dollars. *Observations* System can show sales in dollars, but user does not know this.

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Interviewing Guidelines

6.1 Describe options for designing and conducting interviews and developing a plan for conducting an interview to determine system requirements

- Don't phrase a question in a way that implies a right or wrong answer
- Listen carefully to what is being said
- Record notes within 48 hours after an interview
- Don't set expectations about the new system unless you know these will be deliverables
- Seek a variety of perspectives from the interviews

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Interviewing Groups

6.1 Describe options for designing and conducting interviews and developing a plan for conducting an interview to determine system requirements

- Drawbacks to interviewing individuals:
  - Reconciling contradictions in information collected
  - New interviews may require new questions
  - Not an efficient process
- Group interview advantages:
  - More effective use of time
  - Allows synergy when groups can hear each other
- Primary disadvantage is difficulty in scheduling with multiple people involved

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Nominal Group Technique (NGT)

6.1 Describe options for designing and conducting interviews and developing a plan for conducting an interview to determine system requirements

- **Nominal group technique (NGT)** – facilitated process that supports idea generation by groups. At the beginning of the process, group members work alone to generate ideas. The ideas are then pooled under the guidance of a trained facilitator.
- End result is a listing of either problems or features generated and prioritized by the group
- Can be used as part of a JAD effort

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Directly Observing Users

6.2 Explain the advantages and pitfalls of observing workers and analyzing business documents to determine system requirements

- Direct observation of workers:
  - Watching users work at their jobs
  - Observe actual measure of how employees interact with information systems and how they do their jobs
  - More accurate than interview
  - People can change their normal behavior when they know they are being observed
  - Observation cannot be continuous, thus you are getting only a snapshot of how they work

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Analyzing Procedures and Other Documents (1 of 3)

6.2 Explain the advantages and pitfalls of observing workers and analyzing business documents to determine system requirements

- An analysis of existing documents can give you a wealth of information:
  - Problems with existing systems
  - Opportunities to meet new needs with critical information
  - Identify key people of current system
  - Values of organization who help determine priorities desired by different users
  - Special information processing circumstances that might not otherwise be identified

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Analyzing Procedures and Other Documents (2 of 3)

6.2 Explain the advantages and pitfalls of observing workers and analyzing business documents to determine system requirements

  - Identify left out features of current software that may lead to needed features in future systems
  - Identify processing rules that must be enforced
- A written work procedure describes how a job or task is performed
- **Formal system** – official way a system works as described in organizational documentation.
- **Informal system** – way a system actually works

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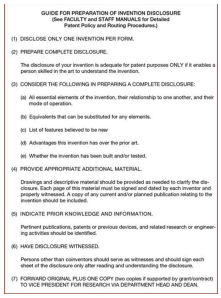
Figure 6-3: Example of a Procedure



GUIDE FOR PREPARATION OF INVENTION DISCLOSURE
(See FACULTY and STAFF MANUALS for Detailed Patent Policy and Routing Procedures.)

(1) DISCLOSE ONLY ONE INVENTION PER FORM.

(2) PREPARE COMPLETE DISCLOSURE.

The disclosure of your invention is adequate for patent purposes ONLY if it enables a person skilled in the art to understand the invention.

(3) CONSIDER THE FOLLOWING IN PREPARING A COMPLETE DISCLOSURE:

(a) All essential elements of the invention, their relationship to one another, and their mode of operation.

(b) Equivalents that can be substituted for any elements.

(c) List of features believed to be new

(d) Advantages this invention has over the prior art.

(e) Whether the invention has been built and/or tested.

(4) PROVIDE APPROPRIATE ADDITIONAL MATERIAL.

Drawings and descriptive material should be provided as needed to clarify the disclosure. Each page of this material must be signed and dated by each inventor and properly witnessed. A copy of any current and/or planned publication relating to the invention should be included.

(5) INDICATE PRIOR KNOWLEDGE AND INFORMATION.

Pertinent publications, patents or previous devices, and related research or engineering activities should be identified.

(6) HAVE DISCLOSURE WITNESSED.

Persons other than coinventors should serve as witnesses and should sign each sheet of the disclosure only after reading and understanding the disclosure.

(7) FORWARD ORIGINAL PLUS ONE COPY (two copies if supported by grant/contract) TO VICE PRESIDENT FOR RESEARCH VIA DEPARTMENT HEAD AND DEAN.

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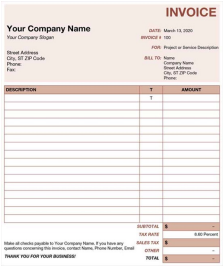
Figure 6-4: An Invoice Form from Microsoft Excel



INVOICE

Your Company Name
Your Company Slogan

Street Address
City, ST ZIP Code
Phone:
Fax:

DATE: March 13, 2020
INVOICE #: 100
FOR: Project or Service Description

BILL TO: Name
Company Name
Street Address
City, ST ZIP Code
Phone:

DESCRIPTION	T	AMOUNT
	T	
SUBTOTAL		$ -
TAX RATE		6.80 Percent
SALES TAX		$ -
OTHER		-
TOTAL		$ -

Make all checks payable to Your Company Name. If you have any questions concerning this invoice, contact Name, Phone Number, Email

THANK YOU FOR YOUR BUSINESS!

(**Source**: Microsoft Corporation)

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Analyzing Procedures and Other Documents (3 of 3)

6.2 Explain the advantages and pitfalls of observing workers and analyzing business documents to determine system requirements

- Four major documents analyzed when creating a new system:
  1. Written work procedure (see figure 6-3)
  2. A form such as the invoice form on the previous slide
     - Gives crucial information about the nature of the organization
  3. A report such as the one on the next slide
     - Can be used to analyze to determine which data to capture
  4. Documents used to describe the system and how it is used
     - Examples include flowcharts, data dictionaries, user manuals

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Figure 6-5: Example of a Report – As Statement of Cash Flows

Mollenkamp Industries
Statement of Cash Flows
October 1 through December 31, 2020

	Oct 1–Dec 31, 2020
OPERATING ACTIVITIES	
Net Income	$39,239.13
Adjustments to reconcile Net Income to net cash provided by operations:	
Accounts Receivable	−$48,571.69
Employee Loans	-62.00
Inventory Asset	−16,827.16
Retainage	−2,481.80
Accounts Payable	29,199.66
Business Credit Card	70.00
BigDil Card	−18.88
Sales Tax Payable	687.65
Net cash provided by Operating Activities	$244.95
INVESTING ACTIVITIES	
Equipment	−$44,500.00
Prepaid Insurance	2,322.66
Net cash provided by Investing Activities	−$42,177.34
FINANCING ACTIVITIES	
Bank Loan	−$868.42
Emergency Loan	3,911.32
Note Payable	−17,009.17
Equipment Loan	43,013.06
Opening Balance Equity	−11,697.50
Owner's Equity: Owner's Draw	−6,000.00
Retained Earnings	6,863.39
Net cash provided by Financing Activities	$20,162.68
Net cash increase for period	−$21,769.71
Cash at beginning of period	−$21,818.46
Cash at end of period	−$43,588.18

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Table 6-4: Comparison of Observation and Document Analysis

Characteristic	Observation	Document Analysis
Information Richness	High (many channels)	Low (passive) and old
Time Required	Can be extensive	Low to moderate
Expense	Can be high	Low to moderate
Chance for Follow-Up and Probing	Good: probing and clarification questions can be asked during or after observation	Limited: probing possible only if original author is available
Confidentiality	Observee is known to interviewer; observee may change behavior when observed	Depends on nature of document; does not change simply by being read
Involvement of Subject	Interviewees may or may not be involved and committed depending on whether they know if they are being observed	None, no clear commitment
Potential Audience	Limited numbers and limited time (snapshot) of each	Potentially biased by which documents were kept or because document was not created for this purpose

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Table 6-5: Contemporary Methods for Collecting System Requirements

Contemporary Methods for Collecting System Requirements
Bringing session users, sponsors, analysts, and others together in a JAD session to discuss and review system requirements
Iteratively developing system prototypes that refine the understanding of system requirements in concrete terms by showing working versions of system features

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Joint Application Design (1 of 3)

6.4 Participate in and help plan a Joint Application Design session

- **Joint Application Design (JAD)** – structured process in which users, managers, and analysts work together for several days in a series of intensive meetings to specify or review system requirements
  - Started by IBM in the late 1970s
  - Primary purpose is to collect system requirements simultaneously from key people involved with the system
  - Enables conflict resolution

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Joint Application Design (2 of 3)

6.4 Participate in and help plan a Joint Application Design session

- Typical JAD participants include:
  - **JAD session leader** – organizes and runs session
  - **Users** – key users of the system
  - **Managers** – managers of the work groups
  - **Sponsor** – high level company executive
  - **Systems analysts** – member of the systems analysis team
  - **Scribe** – records notes from session
  - **IS Staff** – IS staff composed of programmers, database analysts, IS planners, and data center personnel

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Joint Application Design (3 of 3)

6.4 Participate in and help plan a Joint Application Design session

- **JAD session leader** – trained individual who plans and leads Joint Application Design sessions
- **Scribe** – person who makes detailed notes of the happenings at a Joint Application Design session
- End results of a JAD:
  - Documentation detailing existing system
  - Features of proposed system

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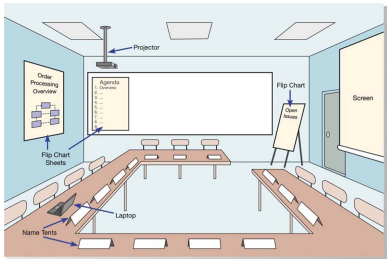
Figure 6-6: Illustration of the Typical Room Layout for a JAD



(**Source**: Based on Wood and Silver, 1995)

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Using Prototyping During Requirements Determination (1 of 4)

6.5 Use prototyping during requirements determination

- **Prototyping** – iterative process of systems development in which requirements are converted to a working system that is continually revised through close collaboration between an analyst and users
  - Quickly converts basic requirements into working, limited version of final information system
  - Viewed and tested by the user
  - Prompts user for modifications for final system

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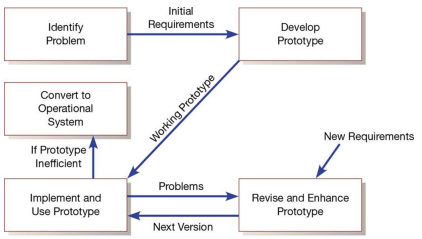
Figure 6-7: The Prototyping Methodology



(**Source**: Based on Naumann, J. D. & Jenkins, A. M. (1982). Prototyping: The New Paradigm for Systems Development. **MIS Quarterly**, 6(3), 29–44)

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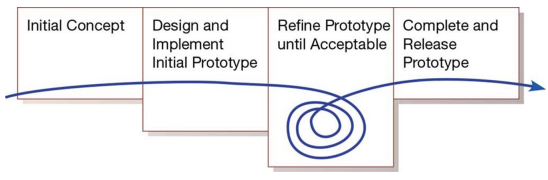
Figure 6-8: McConnell's Evolutionary Prototyping Model



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Using Prototyping During Requirements Determination (2 of 4)

6.5 Use prototyping during requirements determination

- Evolutionary Prototyping
  - Begin by modeling part of the target system
    - If successful, evolve rest of the system from those parts
  - Prototype becomes the actual production system
- Throwaway Prototyping
  - Prototype is not preserved once system is built
  - Quickly developed as a mockup

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Using Prototyping During Requirements Determination (3 of 4)

6.5 Use prototyping during requirements determination

- Prototyping is most useful when:
  - User requirements are not clear
  - Few users are involved in the system
  - Designs are complex and require concrete form to evaluate
  - All want specific system requirements as communication problems have existed in the past
  - Tools and data are readily available to rapidly build a prototype

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Using Prototyping During Requirements Determination (4 of 4)

6.5 Use prototyping during requirements determination

- Drawbacks of prototyping as a tool include:
  - A tendency to avoid creating formal documentation
  - Difficult to adapt to other potential users
  - Built as standalones makes it difficult to adapt to other users
  - SDLC checks are often bypassed

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Business Process Reengineering (BPR)

6.6 Describe contemporary approaches to requirements determination

- **Business process reengineering (BPR)** – search for, and implementation of, radical change in business processes to achieve breakthrough improvements in products and services
  - Reorganize data flow to eliminate unnecessary steps
  - Achieve synergy between previously separate steps
  - Become more responsive to future changes
  - Can be achieved through creative application of information technologies

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Identifying Processes to Reengineer

6.6 Describe contemporary approaches to requirements determination

- **Key business processes** – structured, measured set of activities designed to produce a specific output for a particular customer or market
  - Focused on organizational outcome (e.g., products)
  - Same techniques used as requirements determination
- Which activities need radical change?
  - Importance of activity to delivering an outcome
  - Feasibility of changing the activity
  - Level of dysfunction of current activity

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Disruptive Technologies

6.6 Describe contemporary approaches to requirements determination

- Information technologies must be applied to radically improve business processes
- **Induction** – reasoning from the specific to the general
  - Managers learn power of new technologies and ways to innovate and alter how work is done
- **Disruptive technologies** – technologies that enable breaking long-held business rules that inhibit organizations from making radical business changes

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Table 6-6: Long-Held Organizational Rules That Are Being Eliminated through Disruptive Technologies

Rule	Disruptive Technology
Information can appear in only one place at one time.	Distributed databases allow the sharing of information.
Businesses must choose between centralization and decentralization.	Advanced telecommunications networks can support dynamic organizational structure.
Managers must make all decisions.	Decision-support tools can aid nonmanagers.
Field personnel need offices where they can receive, store, retrieve, and transmit information.	Wireless data communication and portable computers provide a "virtual" office for workers.
The best contact with a potential buyer is personal contact.	Interactive communication technologies allow complex messaging capabilities.
You have to find out where things are.	Automatic identification and tracking technology knows were things are.
Plans get revised periodically.	High-performing computing can provide real-time updating.

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Requirements Determination Using Agile Methodologies

6.6 Describe contemporary approaches to requirements determination

- Continual user involvement replaces the SDLC with iterative analyze—design—code—test cycle
- Agile usage-centered design focuses on user roles, goals, and tasks to achieve those goals (see table 6-7)
- The planning game is a stylized approach to development to maximize interaction between those who use and those who build the system

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Figure 6-9: The Iterative Analysis-Design-Code-Test Cycle

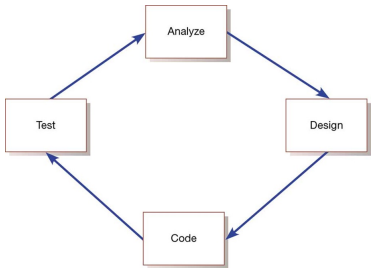

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Table 6-7: Steps in the Agile Usage-Centered Design Method for Requirements Determination

Steps in the Agile Usage-Centered Design Method for Requirements Determination	
1.	Gather a group of people, including analysts, users, programmers, and testing staff, and sequester them in a room to collaborate on this design. Include a facilitator who knows this process.
2.	Give everyone a chance to vent about the current system and to talk about the features everyone wants in the new system. Record all of the complaints and suggestions for change on whiteboards or flip charts for everyone to see.
3.	Determine what the most important user roles would be. Determine who will be using the system and what their goals are for using the system. Write the roles on 3 × 5 cards. Sort the cards so that similar roles are close to each other. Patton (2002) calls this a **role model.**
4.	Determine what tasks user roles will have to complete in order to achieve their goals. Write these down on 3 × 5 cards. Order tasks by importance and then by frequency. Place the cards together based on how similar the tasks are to each other. Patton calls this a **task model.**
5.	Task cards will be grouped together on the table based on their similarity. Grab a stack of cards. This is called an **interaction context.**
6.	For each task card in the interaction context, write a description of the task directly on the task card. List the steps that are necessary to complete the task. Keep the descriptions conversational to make them easy to read. Simplify.
7.	Treat each stack as a tentative set of tasks to be supported by a single aspect of the user interface, such as a screen, page, or dialogue, and create a paper-and-pencil prototype for that part of the interface. Show the basic size and placement of the screen components.
8.	Take on a user role and step through each task in the interaction context as modeled in the paper-and-pencil prototype. Make sure the user role can achieve its goals by using the prototype. Refine the prototype accordingly.

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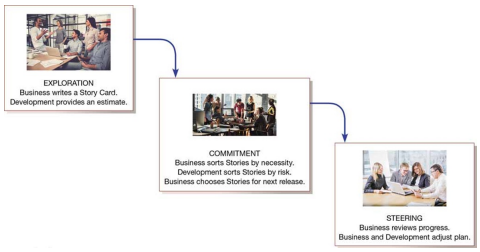
Figure 6-10: eXtreme Programming's Planning Game



(**Sources:** Top to bottom: imtmphoto/ Shutterstock; nenetus/Fotolia; rilueda/Fotolia)

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Electronic Commerce Applications: Determining System Requirements

6.7 Understand how requirements determination techniques determination techniques apply to the development of electronic commerce applications.

- Determining system requirements for Pine Valley Furniture's WebStore
  - System layout and navigation characteristics
  - WebStore and site management system capabilities
  - Customer and inventory information
  - System prototype evolution

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Table 6-8: Desired Layout and Navigation Feature of WebStore

Desired Layout and Navigation Feature of WebStore	Desired Layout and Navigation Feature of WebStore
Layout and Design	• Navigation menu and logo placement should remain consistent throughout the entire site (this allows users to maintain familiarity while using the site and minimizes users who get "lost" in the site) • Graphics should be lightweight to allow for quick page display • Text should be used over graphics whenever possible
Navigation	• Any section of the store should be accessible from any other section via the navigation menu • Users should always be aware of what section they are currently in

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Table 6-9: System Structure of the WebStore and Site Management Systems

WebStore	Site Management System
Main Page Product Line (category) Desks Chairs Tables, File Cabinets Shopping Cart Checkout Account Profile Order Status/History Customer Comments	User Profile Manager
Company Info	Order Maintenance Manager
Feedback	Content (catalog Manager)
Contact Information	Reports Total Hits Most Frequent Page Views Users/Time of Day Users/Day of Week Shoppers Not Purchasing (used shopping cart—did not checkout) Feedback Analysis

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Table 6-10: Customer and Inventory for WebStore

Corporate Customer	Home Office Customer	Student Customer
• Company Name • Company Address • Company Phone • Company Fax • Company Preferred Shipping Method • Buyer Name • Buyer Phone • Buyer E-Mail	• Name • Doing Business as (company name) • Address • Phone • Fax • E-Mail	• Name • School • Address • Phone • E-Mail
Inventory Information	**Inventory Information**	**Inventory Information**
• SKU • Name • Description	• Finished Product Size • Finished Product Weight • Available Materials	• Available Colors • Price • Lead Time

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Table 6-11: Stages of System Implementation of WebStore

Stages of System Implementation of WebStore
Stage 1—Basic Functionality: • Simple catalog navigation; two products per section—limited attributes set • 25 sample users • Simulated credit card transaction • Full shopping cart functionality
Stage 2—Look and Feel: • Full product attribute set and media (images, video)—commonly referred to as the "product data catalog" • Full site layout • Simulated integration with Purchasing Fulfillment and Customer Tracking systems
Stage 3—Staging/Preproduction: • Full integration with Purchasing Fulfillment and Customer Tracking systems • Full credit card processing integration • Full product data catalog

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Summary (1 of 2)

- In this chapter you learned to:
  - Describe options for designing and conducting interviews and developing a plan for conducting an interview to determine system requirements
  - Explain the advantages and pitfalls of observing workers and analyzing business documents to determine system requirements
  - Explain how computing can provide support for requirements determination
  - Participate in and help plan a Joint Application Design session

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Summary (2 of 2)

- In this chapter you learned to:
  - Use prototyping during requirements determination
  - Describe contemporary approaches to requirements determination
  - Understand how requirements determination techniques determination techniques apply to the development of electronic commerce applications

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