Chapter 3: Requirements Determination
Learning Objectives

• Learn how to create a requirements definition
• Learn various requirements analysis techniques
• Learn when to use each requirements analysis techniques
• Learn how to gather requirements using interviews, JAD sessions, questionnaires, document analysis & observation
• Learn various requirements documentation techniques such as concept maps, story cards & task-lists
• Understand when to use each requirements-gathering technique
• Be able to begin the creation of a system proposal
Introduction

- The systems development process transforms the existing (as is) system into the proposed (to be) system

- Requirements determination
  - The single most critical step of the entire SDLC
  - Changes can be made easily in this stage
  - Most (>50%) system failures are due to problems with requirements
  - The iterative process of OOSAD is effective because:
    - Small batches of requirements can be identified and implemented incrementally
    - The system will evolve over time
Requirements Determination

- **Purpose:** To convert high level business requirements (from the system request) into detailed requirements that can be used as inputs for creating models.

- **What is a requirement?**
  - A statement of what the system must do or a characteristic it must have.
  - Will later evolve into a technical description of how the system will be implemented.

- **Types:**
  - **Functional:** relates to a process or data.
  - **Non-functional:** relates to performance or usability.
## Nonfunctional Requirements

<table>
<thead>
<tr>
<th>Requirement type</th>
<th>Example</th>
</tr>
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</table>
| Operational            | • The system should be able to fit in a pocket or purse  
                          • The system should be able to integrate with the existing inventory system.                                                        |
| Performance            | • Any interaction between the user and the system should not exceed 2 seconds.  
                          • The system should receive updated inventory information every 15 minutes.                                                        |
| Security               | • Only direct managers can see personnel records of staff  
                          • Customers can see their order history only during business hours.                                                                    |
| Cultural & Political   | • The system should be able to distinguish between United States and European currency  
                          • The system shall comply with insurance industry standards.                                                                               |
Requirements Definition

- Functional & non-functional requirements listed in outline format
- May be prioritized
- Provides information needed in subsequent workflows
- Defines the scope of the system
Determining Requirements

- Business & IT personnel need to collaborate
- Strategies for effective results:
  - Business Process Analysis (BPA)
  - Business Process Improvement (BPI)
  - Business Process Reengineering (BPR)
Determining Requirements

- Requirements are best determined by systems analysts and business people together.
- Strategies for analyzing the requirements:
  - Business Process Analysis (BPA)
  - Business Process Improvement (BPI)
  - Business Process Reengineering (BPR)
- Techniques for identifying requirements:
  - Interviews, questionnaires and/or observation
  - Joint application development (JAD)
  - Document analysis
Creating a Requirements Definition

- Determine the types of functional and non-functional requirements applicable to the project
- Use requirements-gathering techniques to collect details
- Analysts work with users to verify, change and prioritize each requirement
- Continue this process through analysis workflow, but be careful of scope creep
- Requirements that meet a need but are not within the current scope can be added to a list of future enhancements
Problems in Requirements Determination

- Analyst may not have access to the correct users
- Requirements specifications may be inadequate
- Some requirements may not be known in the beginning
- Verifying and validating requirements can be difficult
Requirements Analysis Strategies

- **Business Process Automation (BPA)**
  - Least amount of change to the current system
  - Use computer technology to automate some portions

- **Business Process Improvement (BPI)**
  - Moderate amount of change is required
  - Designed to improve efficiency of the current system

- **Business Process Reengineering (BPR)**
  - Most amount of change—a complete makeover
  - Focus is on the to-be system—little time spent on the current system
Business Process Automation

- Techniques
  - Problem analysis
    - Ask users to identify problems with the current system
    - Ask users how they would solve these problems
    - Good for improving efficiency or ease-of-use
  - Root cause analysis
    - Focus is on the cause of a problem, not its solution
    - Create a prioritized list of problems
    - Try to determine their causes
    - Once the causes are known, solutions can be developed
Business Process Improvement

- Techniques:
  - Duration analysis
    - Determine the time required to complete each step in a business process
    - Compare this to the total time required for the entire process
    - Large differences suggest problems that might be solved by:
      - Integrating some steps together
      - Performing some steps simultaneously (in parallel)
  - Activity-based costing—same as duration analysis but applied to costs
  - Informal benchmarking—analyzes similar processes in other successful organizations
Business Process Reengineering

- Institutes maximum change: “Out with the old and in with the new”
- Techniques:
  - Outcome analysis—what does the customer want in the end?
  - Technology analysis—apply new technologies to business processes & identify benefits
  - Activity elimination—eliminate each activity in a business process in a “force-fit” exercise
Selecting An Appropriate Strategy

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Potential business value</td>
<td>Low–moderate</td>
<td>Moderate</td>
<td>High</td>
</tr>
<tr>
<td>Project cost</td>
<td>Low</td>
<td>Low–moderate</td>
<td>High</td>
</tr>
<tr>
<td>Breadth of analysis</td>
<td>Narrow</td>
<td>Narrow–moderate</td>
<td>Very broad</td>
</tr>
<tr>
<td>Risk</td>
<td>Low–moderate</td>
<td>Low–moderate</td>
<td>Very high</td>
</tr>
</tbody>
</table>
Requirements Gathering Techniques

- Process is used to:
  - Uncover all requirements (those uncovered late in the process are more difficult to incorporate)
  - Build support and trust among users
- Which technique(s) to use?
  - Interviews
  - Joint Application Development (JAD)
  - Questionnaires
  - Document analysis
  - Observation
Interviews

- Most popular technique—if you need to know something, just ask
- Process:
  - Select people to interview & create a schedule
  - Design interview questions (Open-ended, closed-ended, & probing types of questions)
  - Prepare for the interview (Unstructured vs. structured interview organized in a logical order)
  - Conduct the interview (Top-down vs. bottom-up)
  - Follow-up after the interview
# Question Types

<table>
<thead>
<tr>
<th>Types of Questions</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed-ended questions</td>
<td>• How many telephone orders are received per day?</td>
</tr>
<tr>
<td></td>
<td>• How do customers place orders?</td>
</tr>
<tr>
<td></td>
<td>• What information is missing from the monthly sales report?</td>
</tr>
<tr>
<td>Open-ended questions</td>
<td>• What do you think about the current system?</td>
</tr>
<tr>
<td></td>
<td>• What are some of the problems you face on a daily basis?</td>
</tr>
<tr>
<td></td>
<td>• What are some of the improvements you would like to see in a new system?</td>
</tr>
<tr>
<td>Probing questions</td>
<td>• Why?</td>
</tr>
<tr>
<td></td>
<td>• Can you give me an example?</td>
</tr>
<tr>
<td></td>
<td>• Can you explain that in a bit more detail?</td>
</tr>
</tbody>
</table>
Interviewing Strategies

Top-down

High-level: Very general
- How can order processing be improved?

Medium-level: Moderately specific
- How can we reduce the number of times that customers return ordered items?

Low-level: Very specific
- How can we reduce the number of errors in order processing (e.g., shipping the wrong products)?

Bottom-up
Post-Interview

- Prepare notes and send to the interviewee for verification

<table>
<thead>
<tr>
<th>Interview Notes Approved by: Linda Estey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person Interviewed: Linda Estey,</td>
</tr>
<tr>
<td>Director, Human Resources</td>
</tr>
<tr>
<td>Interviewer: Barbara Wixom</td>
</tr>
<tr>
<td>Purpose of Interview:</td>
</tr>
<tr>
<td>1. Understand reports produced for Human Resources by the current system</td>
</tr>
<tr>
<td>2. Determine information requirements for future system</td>
</tr>
<tr>
<td>Summary of Interview:</td>
</tr>
<tr>
<td>1. Sample reports of all current HR reports are attached to this report. The information that is not used and missing information are noted on the reports.</td>
</tr>
<tr>
<td>2. Two biggest problems with the current system are:</td>
</tr>
<tr>
<td>1. The data are too old (the HR Department needs information within two days of month end; currently information is provided to them after a three-week delay)</td>
</tr>
<tr>
<td>2. The data are of poor quality (often reports must be reconciled with departmental HR database)</td>
</tr>
<tr>
<td>3. The most common data errors found in the current system include incorrect job level information and missing salary information.</td>
</tr>
<tr>
<td>Open Items:</td>
</tr>
<tr>
<td>1. Get current employee roster report from Mary Skudma (extension 4355).</td>
</tr>
<tr>
<td>2. Verify calculations used to determine vacation time with Mary Skudma.</td>
</tr>
<tr>
<td>3. Schedule interview with Jim Wack (extension 2337) regarding the reasons for data quality problems.</td>
</tr>
<tr>
<td>Detailed Notes: See attached transcript.</td>
</tr>
</tbody>
</table>
Joint Application Development (JAD)

- Joint user-analyst meeting hosted by a facilitator
  - 10 to 20 users
  - 1 to 2 scribes as needed to record the session
  - Usually in a specially prepared room
- Meetings can be held electronically and anonymously
  - Reduces problems in group settings
  - Can be held remotely
- Sessions require careful planning to be successful
  - Users may need to bring documents or user manuals
  - Ground rules should be established
Questionnaires

- A set of written questions used to obtain information from individuals
- May be paper based or electronic (e.g., web based)
- Common uses:
  - Large numbers of people
  - Need both information and opinions
  - When designing for use outside the organization (customers, vendors, etc.)
- Typical response rates: < 50% (paper); < 30% (Web)
Questionnaire Steps

- Select the participants
  - Identify the population
  - Use representative samples for large populations
- Designing the questionnaire
  - Careful question selection
  - Remove ambiguities
- Administering the questionnaire
  - Working to get good response rate
  - Offer an incentive (e.g., a free pen)
- Questionnaire follow-up
  - Send results to participants
  - Send a thank-you
Good Questionnaire Design

- Begin with non-threatening and interesting questions
- Group items into logically coherent sections
- No important items at the very end
- Do not crowd a page with too many items
- Avoid abbreviations
- Avoid biased or suggestive items or terms
- Number questions to avoid confusion
- Pretest to identify confusing questions
- Provide anonymity to respondents
Document Analysis

- Provides information about the “as-is” system
- Review technical documents when available
- Review typical user documents:
  - Forms
  - Reports
  - Policy manuals
- Look for user additions to forms
- Look for unused form elements
Observation

- Users/managers often don’t remember everything they do
- Checks validity of information gathered in other ways
- Behaviors may change when people are watched
  - Workers tend to be very careful when watched
  - Keep a low profile
  - Try not to interrupt or influence workers
- Be careful not to ignore periodic activities
  - Weekly … Monthly … Annually
Requirements-Gathering Techniques Compared

- A combination of techniques may be used
- Document analysis & observation require little training; JAD sessions can be very challenging

<table>
<thead>
<tr>
<th></th>
<th>Interviews</th>
<th>Joint Application Design</th>
<th>Questionnaires</th>
<th>Document Analysis</th>
<th>Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of information</strong></td>
<td>As-is, improvements,</td>
<td>As-is, improvements,</td>
<td>As-is,</td>
<td>As-is</td>
<td>As-is</td>
</tr>
<tr>
<td></td>
<td>to-be</td>
<td>to-be</td>
<td>improvements</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Depth of information</strong></td>
<td>High</td>
<td>High</td>
<td>Medium</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Breadth of information</strong></td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Integration of information</strong></td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td><strong>User involvement</strong></td>
<td>Medium</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Cost</strong></td>
<td>Medium</td>
<td>Low–Medium</td>
<td>Low</td>
<td>Low</td>
<td>Low–Medium</td>
</tr>
</tbody>
</table>
Alternative Techniques

- Concept Maps
  - Represent meaningful relationships between concepts
  - Focus individuals on a small number of key ideas
- Story Cards & Task Lists
  - Associated with agile development methods
  - File cards with a single requirement
  - Each requirement is discussed
    - How much effort is required to implement it
    - A task list is created for each requirement (story)
    - Large requirements can be split into smaller sections
The System Proposal

- Combines all material created in planning & analysis
- Included sections:
  - Executive summary
    - Provides all critical information in summary form
    - Helps busy executives determine which sections they need to read in more detail
  - The system request
  - The workplan
  - The feasibility analysis
  - The requirements definition
  - Current models of the system (expected to evolve)
System Proposal Template

1. Table of Contents
2. Executive Summary
   A summary of all the essential information in the proposal so a busy executive can read it quickly and decide what parts of the proposal to read in more depth.
3. System Request
   The revised system request form (see Chapter 2).
4. Workplan
   The original workplan, revised after having completed analysis (see Chapter 2).
5. Feasibility Analysis
   A revised feasibility analysis, using the information from analysis (see Chapter 2).
6. Requirements Definition
   A list of the functional and nonfunctional business requirements for the system (this chapter).
7. Functional Model
   An activity diagram, a set of use case descriptions, and a use case diagram that illustrate the basic processes or external functionality that the system needs to support (see Chapter 4).
8. Structural Models
   A set of CRC cards, class diagram and object diagrams that describe the structural aspects of the to-be system (see Chapter 5). This may also include structural models of the current as-is system that will be replaced.
9. Behavioral Models
   A set of sequence diagrams, communication diagrams, behavioral state machines, and a CRUD matrix that describe the internal behavior of the to-be system (see Chapter 6). This may include behavioral models of the as-is system that will be replaced.

Appendix
These contain additional material relevant to the proposal, often used to support the recommended system. This might include results of a questionnaire survey or interviews, industry reports and statistics, and so on.
Summary

- Presented in this chapter:
  - Discussion of functional and non-functional requirements determination
  - Requirements analysis strategies
  - Requirements gathering techniques
  - Alternative requirements documentation techniques
  - The system proposal