System Analysis and Design UML

Sixth Edition

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Chapter 3

Requirements Determination

The Analysis Phase

- Goal is to develop a clear understanding of the new system's requirements
  - Understand the "As-Is" system
  - Identify Improvements
  - Develop the "To-Be" system concept
- Use critical thinking skills to determine the true causes of problems
- Apply knowledge of IS and business to outline ways to solve the problems in the new system
- To move the users "from here to there," an analyst needs strong critical thinking skills

The Analysis Phase Continued

- It is unrealistic to expect the true requirements to be delivered during a few conversations with the business users

- A number of techniques and tools can be used by the analyst to facilitate this process of discovering requirements

- The final deliverable of the analysis phase is the **system proposal**
  - This is a document compiling the detailed requirements definition statement, use cases, process models, and data model together with a revised feasibility analysis and work plan

- At the conclusion of the analysis phase, the system proposal is presented to the approval committee, usually in the form of a **system walk-through**

The Analysis Phase Continued

- Before moving into the design phase, the project's **business value** should be reviewed to ensure it remains positive

- The line between the analysis and design phases is very blurry

- In many ways, determining requirements is the single-most critical aspect of the entire SDLC

- During requirements determination, the to-be system concept is easy to change because little work has been done yet

- As the system moves through the subsequent SDLC phases, it becomes harder and harder to return to requirements determination and make major changes because of all the rework that is involved

Requirements Determination

- ***Requirements*** determination is performed to transform the system request's high-level statement of business requirements into a more detailed, precise list of what the new system must do

- This detailed list of requirements is supported, confirmed, and clarified by the other activities of the analysis phase

What is a Requirement?

- A *requirement* is a statement of what the system must do or what characteristics it needs to have

- Types of requirements:
  - What the business needs (business requirements)
  - What the users need to do (user requirements)
  - What the software should do (functional requirements)
  - Characteristics the system should have (nonfunctional requirements)
  - How the system should be built (system requirements)

Business Requirements

- In the systems request, there are statements that describe the reasons for proposing the systems development project

- These statements reflect the **business requirements** that this system will fulfill

- When the systems development project is complete, success will be measured by evaluating whether the stated business requirements have been achieved
  - Therefore, they provide the overall direction for the project

User Requirements

- What the user needs to do to complete a needed job or task

- Focus on user tasks that are integral to business operations

- Understanding user tasks helps reveal ways that the new system can support those tasks

Functional Requirements

- A process the system should perform as a part of supporting a user task, or

- Information the system should provide as the user performs a task

- Specify the support the system will provide to the user in fulfilling his/her work tasks

More on Functional Requirements

Functional Requirement	Description	Examples
Process-oriented	A process the system must perform; a process the system must do	• The system must allow registered customers to review their own order history for the past 3 years. • The system must check incoming customer orders for inventory availability. • The system should allow students to view a course schedule while registering for classes.
Information-oriented	Information the system must contain	• The system must retain customer order history for 3 years. • The system must include real-time inventory levels at all warehouses. • The system must include budgeted and actual sales and expense amounts for the current year and 3 previous years.

Nonfunctional Requirements

- Nonfunctional requirements are "the quality attributes, design, and implementation constraints, and external interfaces which a product must have"

- This requirement category includes important behavioral properties that the system must have

- Behavioral properties the system must have
  - Operational – physical and technical operating environment
  - Performance – speed, capacity, and reliability needs
  - Security – access restrictions, needed safeguards
  - Cultural and political – issues that will affect the final system

- Nonfunctional requirements are discussed in Chapter 7

More on Nonfunctional Requirements (1 of 2)

Nonfunctional Requirement	Description	Examples
Operational	The physical and technical environments in which the system will operate	• The system will run on Andriod mobile devices. • The system should be able to integrate with the existing inventory system. • The system should be compatible with any Web browser.
Performance	The speed, capacity, and reliability of the system	• Any interaction between the user and the system should not exceed 2 seconds. • The system downloads new status parameters within 5 minutes of a change. • The system should be available for use 24 hours per day, 365 days per year. • The system supports 300 simultaneous users from 9–11 a.m.; 150 simultaneous users at all other times.

More on Nonfunctional Requirements (2 of 2)

Nonfunctional Requirement	Description	Examples
Security	Who has authorized access to the system under what circumstances	• Only direct managers can see staff personnel records. • Technicians can see only their own work assignments. • The system includes all available safeguards from viruses, worms, Trojan horses, etc.
Cultural and Political	Cultural and political factors and legal requirements that affect the system	• The system should be able to distinguish between US currency and currency from other nations. • Company policy is to buy computers only from Dell. • Country managers are permitted to authorize custom user interfaces within their units. • Personal information is protected in compliance with the Data Protection Act.

The Process of Determining Requirements

- Both business and IT perspectives are needed to determine requirements during the analysis phase
  - Systems analysts may not understand the true business needs of the users
  - The business users may not be aware of promising new technologies
- The analyst must also consider how best to elicit the requirements from the stakeholders
- There are a variety of elicitation techniques that can be used to acquire information
- The evolution of the requirements definition must be carefully managed
- Keeping the requirements list tight and focused is a key to project success

The Requirements Definition Statement

- The requirements definition statement is a straightforward text report that simply lists the functional and nonfunctional requirements in an outline format
  - Usually just called the *requirements definition*
- Requirements are typically identified by numbering
- Sometimes, requirements are prioritized on the requirements definition statement
- The most obvious purpose of the requirements definition is to provide a clear statement of what the new system should do
- A critically important purpose of the requirements definition is to define the scope of the system

Sample Functional Requirements

Functional Requirements

1. Drone Sales Management
  1.1 The system will enable drone sales order creation.
  1.2 The system will determine if the requested drone model is in stock.
  1.3 The system will display all available customization options for a specific drone.
  1.4 The system will create a final approved sales order.
  1.5 The system will prepare a shop work order based on final approved configuration.
  1.6 The system will process a customer deposit.
  1.7 The system will process a customer final payment.

2. Drone Customization Shop Management
  2.1 The system will send a Parts Request for needed drone components on an order to Drone Inventory department.
  2.2 The system enables assignment of a work order to a specific technician.
  2.3 The system records the arrival of component parts as they arrive in the shop parts room.
  2.4 The system notifies the assigned technician when all required components are available for a shop work order.
  2.5 The system enables the technician to record work start time on a work order.
  2.6 The system allows the technician to record when shop order is completed.
  2.7 The system notifies the customer of the order completion.

Sample Nonfunctional Requirements

Nonfunctional Requirements

1. Operational
    1.1 The system should run on tablet devices to be used by salespeople.
    1.2 The system should be Web-based and run on any browser.
    1.3 The system should connect to printers wirelessly.

2. Performance
    2.1 The system should provide response times of 3 seconds or less.
    2.2 The system should be updated with new customer orders and drone inventory levels every 5 minutes.

3. Security
    3.1 Customer accounts should be maintained securely.
    3.2 Only the customization shop supervisor may approve non-standard customizing options.
    3.3 Use of each tablet device should be restricted to the salesperson to whom it is assigned.

4. Cultural and Political
    4.1 Company policy says that all computer equipment is purchased from Dell.

Requirements Elicitation Techniques

- An analyst knows that there is a problem to be solved and therefore must look for clues that uncover the solution

- Unfortunately, the clues are not always obvious, so the analyst needs to notice details, talk with witnesses, and follow leads

- The best analysts will thoroughly search for requirements using a variety of techniques and make sure that the current business processes and the needs for the new system are well understood before moving into design

Requirements Elicitation in Practice

- Use every interaction with managers and users to garner interest, support, and enthusiasm for project
- Choose participants carefully
  - *Stakeholders* are the people who can affect the system or who will be affected by the system
- Make respectful use of people's time

Most Common Requirements Elicitation Techniques

1. Interviews
2. Joint Application Development (JAD) sessions
3. Questionnaires
4. Document analysis
5. Observation

Interviews

- Most important and most used fact-finding technique
  - The systems analysts collects information from individuals face to face
- Who should be interviewed?
  - Managers in early project stages to get broad understanding
  - Staff can provide details and specifics later.
  - Political issues are important – may be necessary to interview influential people, even if they are not too knowledgeable
- Interview Structure
  o Top-down (broad to specific; most common)
 o Bottom-up (specific to broad; useful for collecting details)

Three Types of Questions

Type of Question	Explanation	Examples
Closed-Ended Questions	Require a specific answer	• How many telephone orders are received per day? • How do customers place orders? • What information is missing from the monthly sales report?
Open-Ended Questions	Seek a more wide- ranging response from the interviewee	• What do you think about the way invoices are currently processed? • What are some of the problems you face on a daily basis? • What are some of the improvements you would like to see in the way • invoices are processed?
Probing Questions	Follow up on what has just been discussed so that the interviewer can learn more	• Why? • Can you give me an example? • Can you explain that in a bit more detail?

More on Interviewing

- You should not ask questions about information that is readily available from other sources

- Your interview questions should anticipate the type of information the interviewee is likely to know

- No type of question is better than another
  - Usually a combination of questions is used during an interview.

Top-Down and Bottom-Up Questioning Strategies
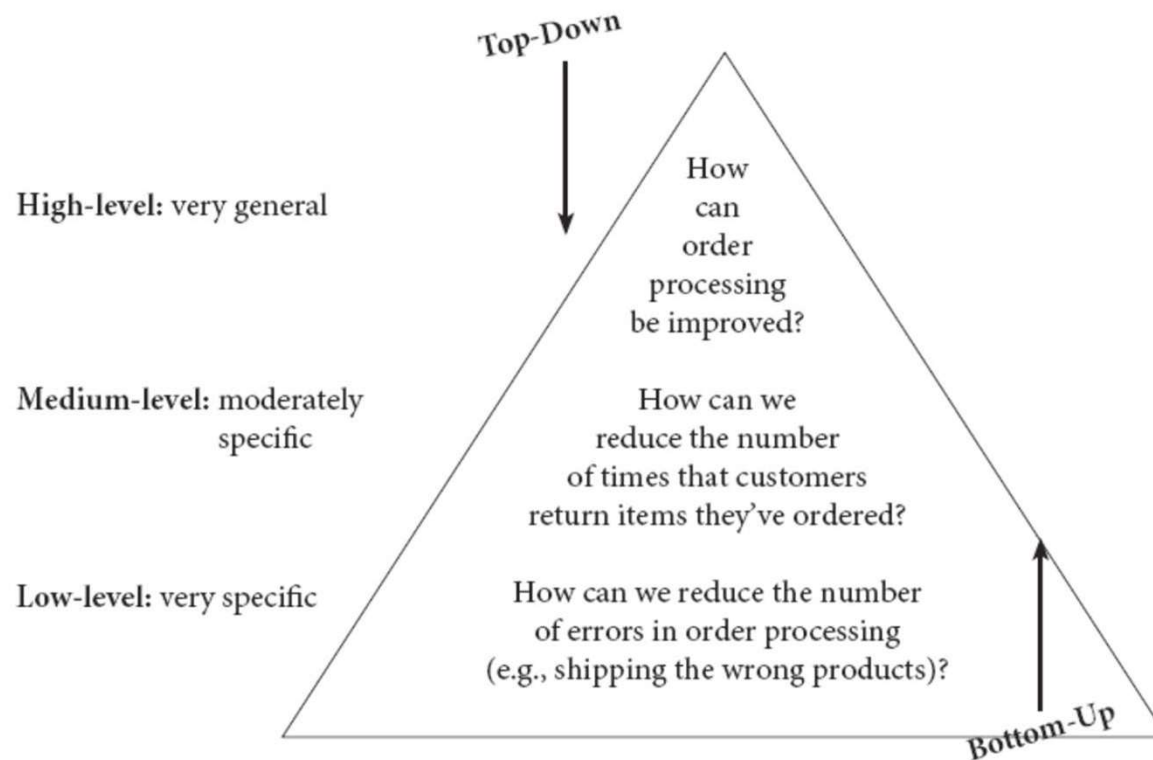
Interview as a Requirements Elicitation Technique

Strengths

- Interviewee can respond freely and openly to questions

- Interviewee can be asked for more feedback

- Questions can be adapted or reworded for each individual

- Interviewee's nonverbal communication can be observed

Weaknesses

- Very time-consuming, and therefore costly, fact-finding approach

- Success is highly dependent on the systems analyst's human relations skills

- May be impractical due to the location of interviewees

Preparing for the Interview

- You should have an interview plan that lists the topics/issues that you will ask in the appropriate order

- Confirm the areas in which the interviewee has knowledge so you do not ask questions that they cannot answer

- Structured interviews with closed-ended questions take more time to prepare than unstructured interviews

- When you schedule the interview, inform the interviewee of the reason for the interview and the areas you will be discussing

Conducting the Interview

- The first goal is to build rapport with the interviewee
- It is critical to carefully record all the information that the interviewee provides
  - Take lots of notes
- If you do not understand something, be sure to ask
  - Do not be afraid to ask "dumb questions"
- Separate facts from opinion
- As the interview draws to a close, give the interviewee time to ask questions or provide information that they thinks is important
- Briefly explain what will happen next

Post- interview Follow-Up

- After the interview is over, the analyst needs to prepare an interview report
- The **_interview report_** describes the information from the interview
- It contains interview notes
- Often, the interview report is sent to the interviewee with a request to read it and inform the analyst of clarifications or updates

Joint Application Development (JAD)

- **Joint Application Development** (JAD) is an information gathering technique that allows the project team, users, and management to work together to identify requirements for the system
- Its goal is to produce complete requirements definition document
- Directly involves project sponsor, key managers, and key users with systems analysts
- Requires a trained facilitator
- Requires a comfortable facility for long-term, intensive group work; preferably off-site
- Expensive but valuable

Electronic JAD or e-JAD

- Any group activity may experience problems with group dynamics
- e-JAD helps group overcome group dynamic issues – dominance, status differences, fear of reprisal
- e-JAD provides ways for members to contribute, comment on, and rate ideas anonymously
- Requires a trained e-JAD facilitator and groupware software

More on JAD

- Participants are selected on the basis of information they can contribute, to provide a broad mix of organizational levels, and to build political support for the new system
  - Should be released from regular duties to attend
- JAD sessions can run from as little as a half day to several weeks
- JAD sessions usually are designed and structured along the same principles as interviews
  - Closed-ended questions are seldom used
- It is important to prepare the analysts and participants for the JAD session

Conducting the JAD Session

- Most JAD sessions try to follow a formal agenda

- Most also have formal ground rules that define appropriate behavior

- The JAD facilitator performs three key functions
  1. They ensure that the group sticks to the agenda
  2. They help the group understand the technical terms and jargon that surround the system development process
  3. They record the group's input on a public display area

- The facilitator should try to help the group resolve issues

- It is common for the JAD participants to make use of several tools during the JAD session to fully define the new system

Post-JAD Follow-Up

- A JAD post-session report is prepared and circulated among session attendees
- The post- session report is essentially the same as the interview report
- Usually takes a week or two

Questionnaires

- A **questionnaire** is a set of written questions for obtaining information from individuals
  - Mass produced and distributed
  - Respondents complete the questionnaire on their own time
- Facts are collected from a large number of people while maintaining uniform responses
  - When dealing with a large audience, no other fact-finding technique can tabulate the same facts as efficiently

Questionnaires Continued

- The first step is to select the individuals to whom the questionnaire will be sent

- Developing good questions is critical for questionnaires because the information on a questionnaire cannot be clarified

- You must have a clear understanding of how the information collected from the questionnaire will be analyzed and used

- Questions should be relatively consistent in style so that the respondent does not have to read instructions for each question

- The key issue in administering the questionnaire is getting participants to complete the questionnaire and send it back

Good Questionnaire Design

- Begin with nonthreatening and interesting questions
- Group items into logically coherent sections
- Do not put important items at the very end of the questionnaire
- Do not crowd a page with too many items
- Avoid abbreviations
- Avoid biased or suggestive items or terms
- Number questions to avoid confusion
- Pretest the questionnaire to identify confusing questions
- Provide anonymity to respondents

Questionnaires as a Requirements Elicitation Technique

Strengths

- Most can be answered quickly (if properly designed)
- Relatively inexpensive
- Allow individuals to maintain anonymity
- Can be tabulated and analyzed quickly (if properly designed)

Weaknesses

- Response is often low. How to motivate participation?
- Incomplete questionnaires returned – are these worthless?
- Tend to be inflexible
- Body language cannot be observed
- Cannot clarify a vague or incomplete answer to any question
- Difficult to prepare a successful questionnaire

Questionnaires – Practical Tips

- Determine what facts and opinions must be collected and from whom you should get them

- Based on the needed facts and opinions, determine whether free- or fixed-format questions will produce the best answers.   A mix of types may be ideal.

- Write the questions

- Pretest the questions on a small sample of "typical" respondents – not just other systems analysts

- Use random sampling if necessary

Document Analysis

- Collect facts from existing documentation
  - Organizational chart
  - History that led to the project
  - Documentation from previous system studies and designs performed by systems analysts and consultants
- Analyze facts to determine currency
  - Even outdated documentation may be useful
  - Must recognize what is current and what is outdated
- Analyze to understand the documentation
  - Take notes, draw pictures, and use systems analysis and design tools to model what you are learning or proposing for the system
- Use appropriate sampling techniques

Document Analysis – Practical Tips

- Good place to start
  - History
  - Vocabulary
  - Key personnel
- Learn as much as you can from existing documentation
- People get annoyed being asked about things you could have learned from existing documentation

Sample Document Analysis

Observation

- ***Observation*** , the act of watching processes being performed, is a powerful tool to gain insight into the as- is system

- Use when the validity of data collected using other methods is in question

- Use when the complexity of certain aspects of the system prevents end-users from providing a clear explanation

Observation as a Requirements Elicitation Technique

Strengths

- Data gathered may be highly reliable

- Can see exactly what is being done

- Relatively inexpensive (compared with other fact-finding techniques)

- Can do work measurements (if needed)

Weaknesses

- People may perform differently when being observed

- Work may vary in difficulty and volume

- Some activities may take place at odd times

- The tasks being observed are subject to various types of interruptions

Observation– Practical Tips

- Properly plan for observation

- Obtain approval and inform people of your purpose

- Conduct observations first when the work load is normal, followed by observations during peak periods

- Obtain samples of documents or forms that will be used by those being observed

- Apply the sampling techniques discussed earlier for observation

- Review observation notes with appropriate individuals

Comparison of Requirements Elicitation Techniques

	Interviews	Joint Application Design	Questionnaires	Document Analysis	Observation
Type of information	As-is, improvements, to-be	As-is, improvements, to-be	As-is, improvements	As-is	As-is
Depth of information	High	High	Medium	Low	Low
Breadth of information	Low	Medium	High	High	Low
Integration of information	Low	High	Low	Low	Low
User involvement	Medium	High	Low	Low	Low
Cost	Medium	Low–Medium	Low	Low	Low–Medium