6

REQUIREMENTS DISCOVERY

Chapter Map

Source: System Analysis and Design Methods, 5th Edition, McGraw Hill.

Introduction to Requirements Discovery

Requirements discovery includes those techniques to be used by systems analysts to identify or extract system problems and solution requirements from the user community.

Problem analysis is the activity of identifying the problem, understanding the problem (including causes and effects), and understanding any constraints that may limit the solution.

Introduction to Requirements Discovery

A system requirement (also called a *business requirement*) is a description of the needs and desires for an information system. A requirement may describe functions, features (attributes), and constraints.

Types of Requirements

A functional requirement is a function or feature that must be included in an information system in order to satisfy the *business need* and be *acceptable to the users*.

A nonfunctional requirement is a description of the features, characteristics, and attributes of the system as well as any constraints that may limit the boundaries of the proposed solution.

Types of Functional Requirements

Requirement Type	Explanation
Performance	**Performance requirements represent the performance the system is required to exhibit to meet the needs of users.** · **What is the acceptable throughput rate?** · **What is the acceptable response time?**
Information	**Information requirements represent the information that is pertinent to the users in terms of content, timeliness, accuracy, and format.** · **What are the necessary inputs and outputs? When must they happen?** · **What is the required data to be stored?** · **How current must the information be?** · **What are the interfaces to external systems?**
Economic	**Economy requirements represent the need for the system to reduce costs or increase profits.** · **What are the areas of the system where costs must be reduced?** · **How much should costs be reduced or profits be increased?** · **What are the budgetary limits?** · **What is the timetable for development?**
Control (and Security)	**Control requirements represent the environment in which the system must operate, as well as the type and degree of security that must be provided.** · **Must access to the system or information be controlled?** · **What are the privacy requirements?** · **Does the criticality of the data necessitate the need for special handling (backups, offsite storage, etc.) of the data?**

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# Types of Functional Requirements (concluded)

| Requirement Type	Explanation
Efficiency	Efficiency requirements represent the systems ability to produce outputs with minimal waste. · Are there duplicate steps in the process that must be eliminated? · Are there ways to reduce waste in the way the system uses it resources?
Service	Service requirements represent needs in order for the system to be reliable, flexible, and expandable. · Who will use the system and where are they located? · Will there be different types of users? · What are the appropriate human factors? · What training devices and training materials are to be included in the system? · What training devices and training materials are to be developed and maintained separately from the system, such as stand- alone computer based training (CBT) programs or databases? · What are the reliability/availability requirements? · How should the system be packaged and distributed? · What documentation is required?

An Ambiguous Requirements Statement

Requirement:

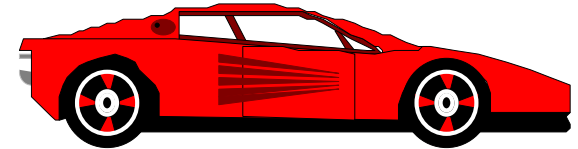Create a means to transport a single individual from home to place of work.

Management Interpretation
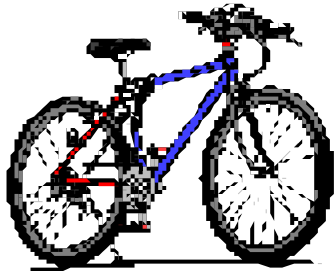
I T Interpretation
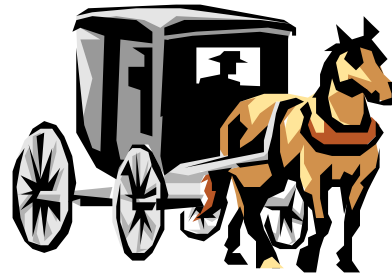
User Interpretation

Results of Incorrect Requirements

- The system may cost more than projected.

- The system may be delivered later than promised.

- The system may not meet the users' expectations and that dissatisfaction may cause them not to use it.

- Once in production, the costs of maintaining and enhancing the system may be excessively high.

- The system may be unreliable and prone to errors and downtime.

- The reputation of the IT staff on the team is tarnished because any failure, regardless of who is at fault, will be perceived as a mistake by the team.

Relative Cost to Fix an Error   by Barry W. Boehm

| Phase in Which Found	Cost Ratio
Requirements	**1**
Design	**3-6**
Coding	**10**
Development Testing	**15-40**
Acceptance Testing	**30-70**
Operation	**40-1000**

Criteria to Define System Requirements

- Consistent
- Complete
- Feasible
- Required
- Accurate
- Traceable
- Verifiable

The Process of Requirements Discovery

1 Problem discovery and analysis
2 Requirements discovery
3 Documenting and analyzing requirements
4 Requirements management

a) Problem Discovery: Ishikawa Diagram

The Ishikawa diagram is a graphical tool used to identify, explore, and depict problems and the causes and effects of those problems. It is often referred to as a cause-and-effect diagram or a fishbone diagram.
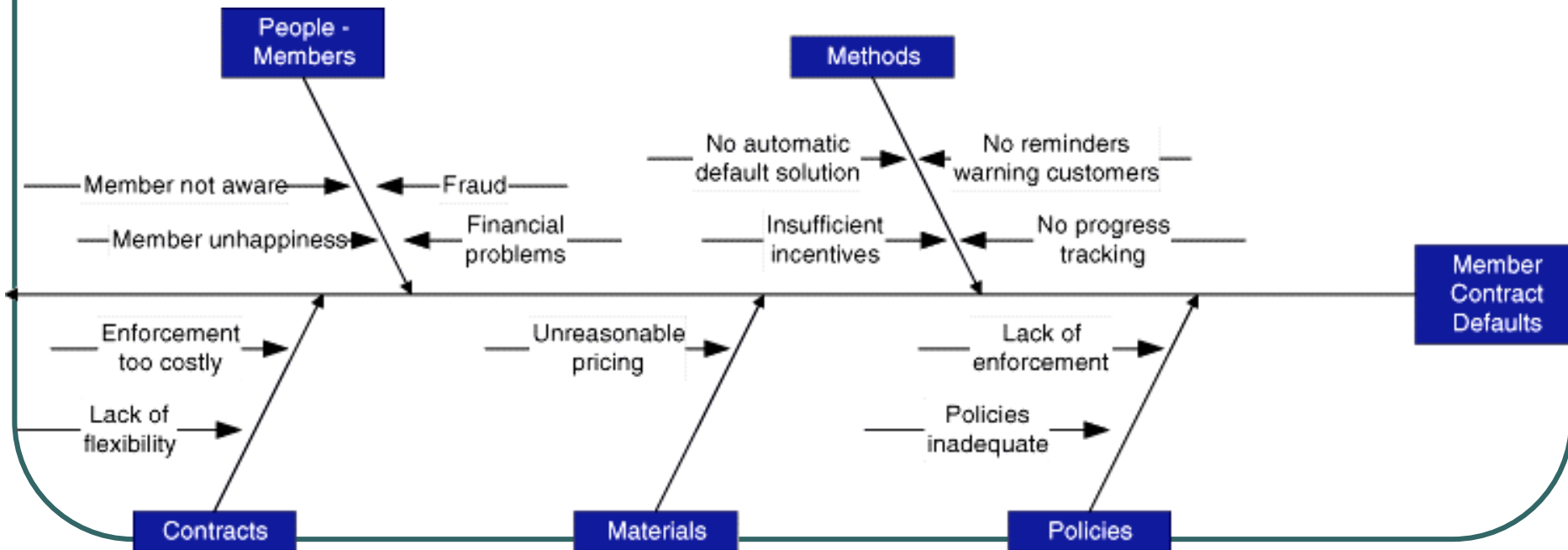
b) Requirements Discovery

Fact-finding is the formal process of using research, interviews, questionnaires, sampling, and other techniques to collect information about problems, requirements, and preferences. It is also called information gathering.

Seven Fact-Finding Methods

1. Sampling of existing documentation, forms, and databases.

2. Research and site visits.

3. Observation of the work environment.

4. Questionnaires.

5. Interviews.

6. Prototyping.

7. Joint requirements planning (JRP).

c) Documenting and Analyzing Requirements

A requirements definition document should consist of the following.

- The functions and services the system should provide.
- Nonfunctional requirements including the system's features, characteristics, and attributes.
- The constraints that restrict the development of the system or under which the system must operate.
- Information about other systems the system must interface with.

Sample Requirements Definition Outline

Requirements Definition Report

1. Introduction

    1.1 Purpose

    1.2 Background

    1.3 Scope

    1.4 Definitions, Acronyms, and Abbreviations

    1.5 References

2. General Project Description

    2.1 System Objectives

3. Requirements and Constraints

    3.1 Functional Requirements

    3.2 Nonfunctional Requirements + 3.3 Constraints

4. Conclusion

    4.1 Outstanding Issues

Validating Requirements

Requirements validation is an activity that checks the requirements definition document for accuracy, completeness, consistency, and conformance to standards.

d) Requirements Management

Requirements management is the process of managing change to the requirements.

- New requirement + change existing requirement
- 50 % requirement change before being product
- Need policy / procedure / process for managing changes
  - Contract point
  - Analyze the effect on scope, schedule and cost
  - Make decision (approve or reject)
  - Implement changes

1. Sampling

- Sampling is the process of collecting a representative sample of documents, forms, and records.

  - Determining the sample size (SS):

    - Sample Size = 0.25 x (Certainty factor/Acceptable error)^2

  - For a 90% certainty:

    - Sample Size = $0.25(1.645/0.10)^2 = 68$

- Desired certainty   Certainty factor

Desired certainty	Certainty factor
95%	1.960
90%	1.645
80%	1.281

Sampling Techniques

Randomization is a sampling technique characterized as having no predetermined pattern or plan for selecting sample data.

Stratification is a systematic sampling technique that attempts to reduce the variance of the estimates by spreading out the sampling—for example, choosing documents or records by formula—and by avoiding very high or low estimates.

2. Observation

Observation is a fact-finding technique wherein the systems analyst either participates in or watches a person perform activities to learn about the system.

Advantages?

Disadvantages?

Work sampling is a fact-finding technique that involves a large number of observations taken at random intervals.

Observation Guidelines

- Determine the who, what, where, when, why, and how of the observation.

- Obtain permission from appropriate supervisors or managers.

- Inform those who will be observed of the purpose of the observation.

- Keep a low profile.

- Take notes during or immediately following the observation.

- Review observation notes with appropriate individuals.

- Don't interrupt the individuals at work.

- Don't focus heavily on trivial activities.

- Don't make assumptions.

3. Questionnaires

Questionnaires are special-purpose documents that allow the analyst to collect information and opinions from respondents.

- Advantages?
- Disadvantages?

Types of Questionnaires

Free-format questionnaires offer the respondent greater latitude in the answer. A question is asked, and the respondent records the answer in the space provided after the question.

Fixed-format questionnaires contain questions that require selection of predefined responses from individuals.

Types of Fixed-Format Questions

- Multiple-choice/ choose questions
- Rating questions   1..5
- Ranking questions

Questionnaire Procedure

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

2. Based on the needed facts and opinions, determine whether free- or fixed-format questions will produce the best answers.

3. Write the questions.

4. Test the questions on a small sample of respondents.

5. Duplicate and distribute the questionnaire.

4. Interviews

Interviews are a fact-finding technique whereby the systems analysts collect information from individuals through face-to-face interaction.

- Advantages?

- Disadvantages?

Types of Interviews

Unstructured interviews are conducted with only a general goal or subject in mind and with few, if any, specific questions. The interviewer counts on the interviewee to provide a framework and direct the conversation.

In structured interviews the interviewer has a specific set of questions to ask of the interviewee.

Types of Interview Questions

Open-ended questions allow the interviewee to respond in any way that seems appropriate.

E.g. Ask for opinion

Closed-ended questions restrict answers to either specific choices or short, direct responses.

E.g. Fix the answer either Yes or No

Procedure to Conduct an Interview

1 Select Interviewees

2 Prepare for the Interview

- An interview guide is a checklist of specific questions the interviewer will ask the interviewee.

3 Conduct the Interview

4 Follow Up on the Interview

Interview Questions

- Types of Questions to Avoid
  - Loaded questions
  - Leading questions
  - Biased questions

- Interview Question Guidelines Page 234
  - Use clear and concise language.
  - Don't include your opinion as part of the question.
  - Avoid long or complex questions.
  - Avoid threatening questions.
  - Don't use "you" when you mean a group of people.

Sample Interview Guide (concluded)

Interviewee: Jeff Bentley, Accounts Receivable Manager
Date: Tuesday, March, 23, 2000
Time: 1:30 P.M.
Place: Room 223, Admin. Bldg.
Subject: Current Credit-Checking Policy

Time Allocated	Interviewer Question of Objective	Interviewee Response
1 to 2 min.	**Objective** Open the interview: • Introduce Ourselves • Thank Mr. Bentley for his valuable time • State the purpose of the interview--to obtain an understanding of the existing credit-checking policies	
5 min.	**Question 1** What conditions determine whether a customer's order is approved for credit? **Follow-up**	
5 min.	**Question 2** What are the possible decisions or actions that might be taken once these conditions have been evaluated? **Follow-up**	
3 min.	**Question 3** How are customers notified when credit is not approved for their order? **Follow-up**	

(continued)

Sample Interview Guide (concluded)

1 min.	**Question 4** After a new order is approved for credit and placed in the file containing orders that can be filled, a customer might request that a modification be made to the order. Would the order have to go through credit approval again if the new total order cost exceeds the original cost? **Follow-up**	
1 min.	**Question 5** Who are the individuals that perform the credit checks? **Follow-up**	
1 to 3 mins.	**Question 6** May I have permission to talk to those individuals to learn specifically how they carry out the credit-checking process? **Follow-up**	
1 min.	**Objective** Conclude the interview: • Thank Mr. Bentley for his cooperation and assure him that he will be receiving a copy of what transpired during the interview	
21 minutes	Time allotted for base questions and objectives.	
9 minutes	Time allotted for follow-up questions and redirection	
30 minutes	Total time allotted for interview (1:30 p.m. to 2:00 p.m.)	

General Comments and Notes:

Interviewing Do's and Don'ts

Do

- Be courteous
- Listen carefully
- Maintain control
- Probe (real)
- Observe mannerisms and nonverbal communication
- Be patient
- Keep interviewee at ease
- Maintain self-control

Avoid

- Continuing an interview unnecessarily.
- Assuming an answer is finished or leading nowhere.
- Revealing verbal and nonverbal clues.
- Using jargon
- Revealing your personal biases.
- Talking instead of listening.
- Assuming anything about the topic and the interviewee.
- Tape recording -- a sign of poor listening skills.

Communicating With the User

- Listening - "To hear is to recognize that someone is speaking, to listen is to understand what the speaker wants to communicate." (Gildersleeve – 1978)

- Guidelines for Communicating
  - Approach the Session with a Positive Attitude
  - Set the Other Person at Ease
  - Let Them Know You Are Listening
  - Ask Questions
  - Don't Assume Anything
  - Take Notes

Body Language and Proxemics

Body language is all of the nonverbal information being communicated by an individual. Body language is a form of nonverbal communications that we all use and are usually unaware of.

Proxemics is the relationship between people and the space around them. Proxemics is a factor in communications that can be controlled by the knowledgeable analyst.

Spatial Zones

- Intimate zone—closer than 1.5 feet

- Personal zone—from 1.5 feet to 4 feet

- Social zone—from 4 feet to 12 feet

- Public zone—beyond 12 feet

5. Discovery Prototyping

Discovery prototyping is the act of building a small-scale, representative or working model of the users' requirements in order to discover or verify those requirements.

- Advantages?

- Disadvantages?

6. Joint Requirements Planning

Joint requirements planning (JRP) is a process whereby highly structured group meetings are conducted for the purpose of analyzing problems and defining requirements. JRP is a subset of a more comprehensive joint application development or JAD technique that encompasses the entire systems development process.
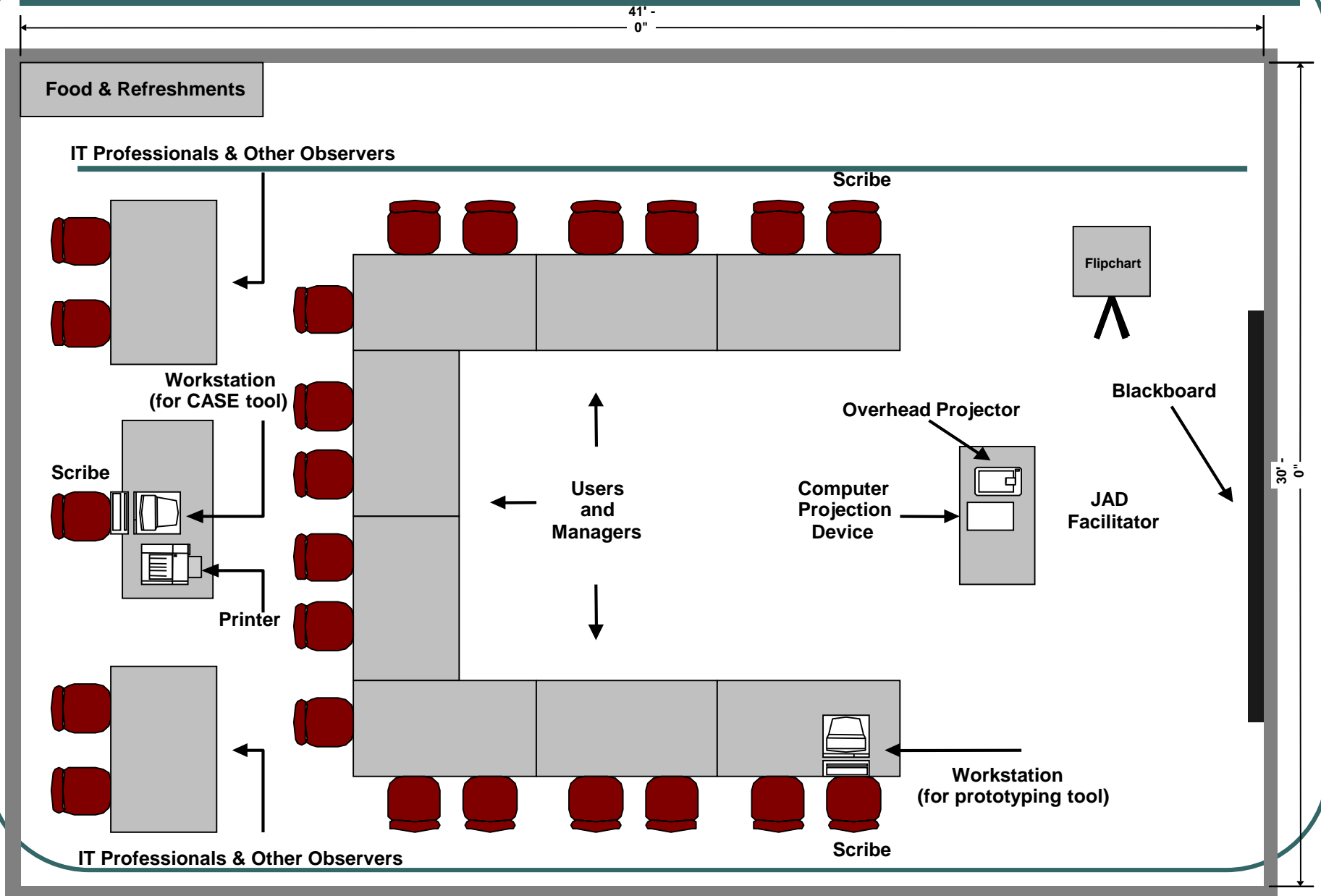
JRP Participants

- Sponsor
- Facilitator
- Users and Managers
- Scribes
- I.T. Staff

Steps to Plan a JRP Session

- Selecting a location
- Selecting the participants
- Preparing the agenda

Typical room layout for JRP session

Source: System Analysis and Design Methods, 5th Edition, McGraw Hill.

Guidelines for Conducting a JRP Session

- Do not unreasonably deviate from the agenda
- Stay on schedule
- Ensure that the scribe is able to take notes
- Avoid the use of technical jargon
- Apply conflict resolution skills
- Allow for ample breaks (refreshment)
- Encourage group consensus
- Encourage user and management participation without allowing individuals to dominate the session
- Make sure that attendees abide (no-end) by the established ground rules for the session

Brainstorming

Brainstorming is a technique for generating ideas during group meetings. Participants are encouraged to generate as many ideas as possible in a short period of time without any analysis until all the ideas have been exhausted.

Brainstorming Guidelines

- Isolate the appropriate people in a place that will be free from distractions and interruptions

- Make sure that everyone understands the purpose of the meeting

- Appoint one person to record ideas

- Remind everyone of the brainstorming rules

- Within a specified time period, team members call out their ideas as quickly as they can think of them

- After the group has run out of ideas and all ideas have been recorded, then and only then should the ideas be analyzed and evaluated

- Refine, combine, and improve the ideas that were generated earlier

Benefits of JRP

- JRP actively involves users and management in the development project (encouraging them to take "ownership" in the project)

- JRP reduces the amount of time required to develop systems

- When JRP incorporates prototyping as a means for confirming requirements and obtaining design approvals, the benefits of prototyping are realized

A Fact-Finding Strategy

1. Learn all you can from existing documents, forms, reports, and files

2. If appropriate, observe the system in action

3. Given all the facts that you've already collected, design and distribute questionnaires to clear up things you don't fully understand

4. Conduct your interviews (or group work sessions)

5. Build discovery prototypes for any functional requirements that are not understood or if requirements need to be validated

6. Follow up

Summary

- System Requirements
- The activity of problem analysis and Ishikawa diagram
- The concept of requirements management.
- Seven fact-finding techniques
- A JRP as a fact-finding technique.
- Techniques to document and analyze requirements.
- Understand use cases and be able to document them.