



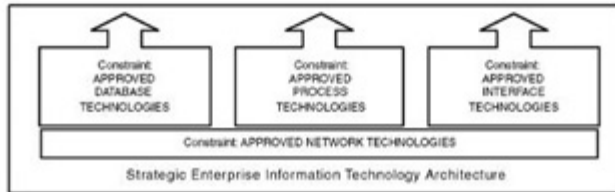
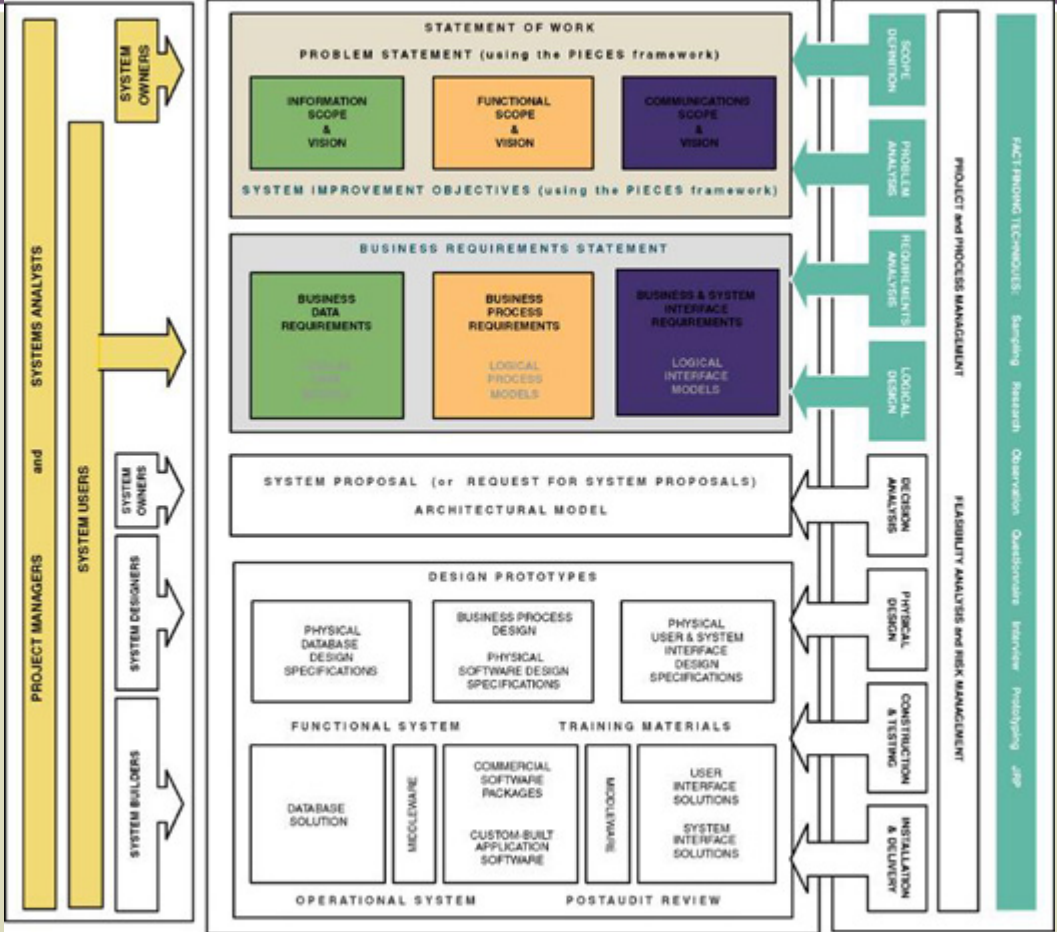
SEVENTH EDITION

SYSTEMS
ANALYSIS
& DESIGN
METHODS

WHITTEN
BENTLEY

Objectives

- Define system requirements and differentiate between functional and nonfunctional requirements.
- Understand the activity of problem analysis and be able to create an Ishikawa (fishbone) diagram.
- Understand the concept of requirements management.
- Identify and characterize seven fact-finding techniques.
- Understand six guidelines for effective listening.
- Understand body language and proxemics.
- Characterize the typical participants in a JRP session.
- Complete the planning process for a JRP session.
- Describe benefits of JRP as fact-finding technique.
- Describe a fact-finding strategy that will make the most of your time with end-users.



Introduction to Requirements Discovery

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

System requirement – something that the information system must do or a property that it must have. Also called a *business requirement*.

Functional vs. Nonfunctional Requirements

Functional requirement - something the information system must do

Nonfunctional requirement - a property or quality the system must have

- Performance
- Security
- Costs

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 they may not to use it.
- Once in production, costs of maintaining and enhancing system may be excessively high.
- The system may be unreliable and prone to errors and downtime.
- Reputation of IT staff is tarnished as failure will be perceived as a mistake by the team.

Relative Cost to Fix an Error

Phase in Which Error Discovered	Cost Ratio
Requirements	1
Design	3–6
Coding	10
Development Testing	15–40
Acceptance Testing	30–70
Operation	40–1000

Criteria for System Requirements

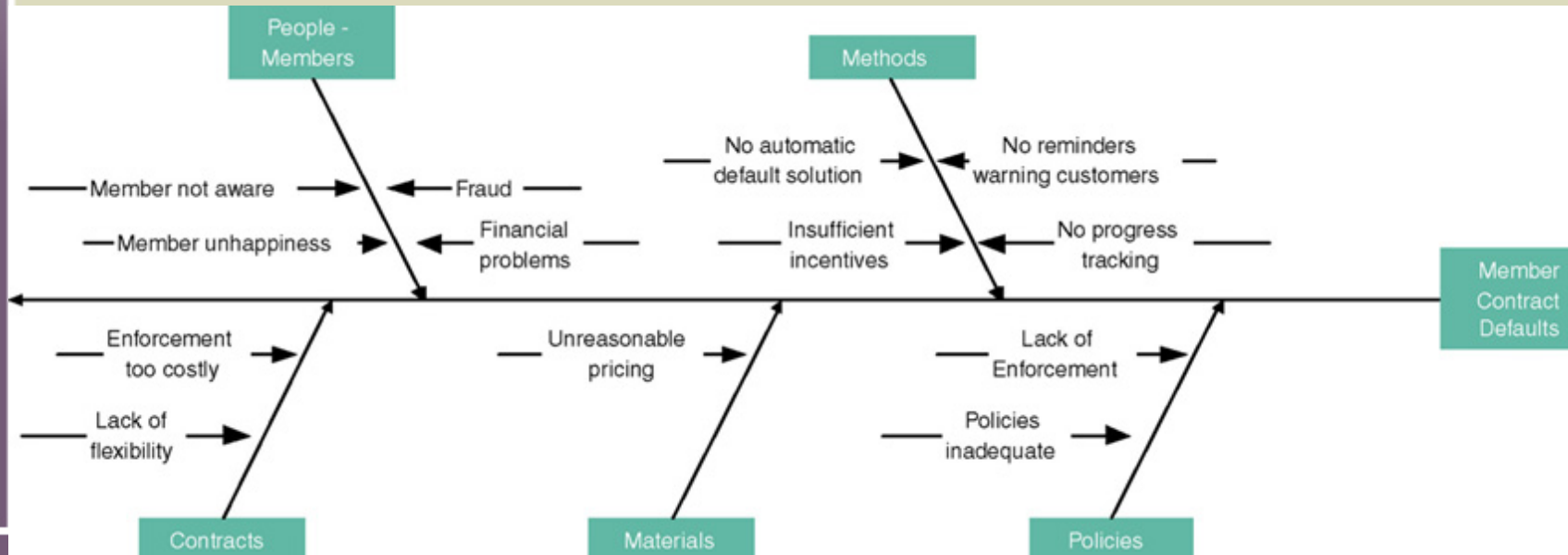
- **Consistent** – not conflicting or ambiguous.
- **Complete** – describe all possible system inputs and responses.
- **Feasible** – can be satisfied based on the available resources and constraints.
- **Required** – truly needed and fulfill the purpose of the system.
- **Accurate** – stated correctly.
- **Traceable** – directly map to functions and features of system.
- **Verifiable** – defined so can be demonstrated during testing.

Process of Requirements Discovery

- Problem discovery and analysis
- Requirements discovery
- Documenting and analyzing requirements
- Requirements management

Ishikawa Diagram

- 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.
 - Problem at right (fish head)
 - Possible causes drawn as "bones" off main backbone
 - Brainstorm for 3-6 main categories of possible causes



Requirements Discovery

- Given an understand of problems, the systems analyst can start to define requirements.

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

Documenting and Analyzing Requirements

- Documenting the draft requirements
 - Use cases
 - Decision tables
 - Requirements tables
- Analyzing requirements to resolve problems
 - Missing requirements
 - Conflicting requirements
 - Infeasible requirements
 - Overlapping requirements
 - Ambiguous requirements
- Formalizing requirements
 - Requirements definition document
 - Communicated to stakeholders or steering body

Requirements Definition Document

Requirements Definition Document – A formal document that communicates the requirements of a proposed system to key stakeholders and serves as a contract for the systems project.

- Synonyms
 - Requirements definition report
 - Requirements statement
 - Requirements specification
 - Functional specifications

Sample Requirements Definition Report 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. Functional Requirements
 3. Requirements and Constraints
 - 3.1. Functional Requirements
 - 3.2. Nonfunctional Requirements
 4. Conclusion
 - 4.1. Outstanding Issues
- Appendix (optional)

Requirements Management

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

- Over the lifetime of the project it is very common for new requirements to emerge and existing requirements to change.
- Studies have shown that over the life of a project as much as 50 percent or more of the requirements will change before the system is put into production.

Fact-Finding Ethics

- Fact-Finding often brings systems analysts into contact with sensitive information.
 - Company plans
 - Employee salaries or medical history
 - Customer credit card, social security, or other information
- Ethical behavior
 - Systems analysts must not misuse information.
 - Systems analysts must protect information from people who would misuse it.
- Otherwise
 - Systems analyst loses respect, credibility, and confidence of users and management, impairing ability to do job
 - Organization and systems analyst could have legal liability
 - Systems analyst could lose job

Seven Fact-Finding Methods

- Sampling of existing documentation, forms, and databases.
- Research and site visits.
- Observation of the work environment.
- Questionnaires.
- Interviews.
- Prototyping.
- Joint requirements planning (JRP).

Sampling Existing Documentation, Forms, & Files

Sampling –process of collecting a representative sample of documents, forms, and records.

- Organization chart
- Memos and other documents that describe the problem
- Standard operating procedures for current system
- Completed forms
- Manual and computerized screens and reports
- Samples of databases
- Flowcharts and other system documentation
- And more


Things to be Gleaned from Documents

- Symptoms and causes of problems
- Persons in organization who have understanding of problem
- Business functions that support the present system
- Type of data to be collected and reported by the system
- Questions that need to be covered in interviews

Why to Sample Completed Rather than Blank Forms

- Can determine type of data going into each blank
- Can determine size of data going into each blank
- Can determine which blanks are not used or not always used
- Can see data relationships

IT SERVICES
Service Request



Computer Name	Assigned To	Report Date	Resolution Date
Reverb	CIS	2/18/01	3/1/01

Reported By	Ext
Greg Kaufman	0982

Problem Description
Monitor won't come on

Work Date	Tech	Work Comments
2/18/01	Connie Bailey	Verified problem in video card. Installed loaner card
3/1/01	Connie Bailey	Installed new video card

Determining Sample Size for Forms

- Sample Size = $0.25 \times (\text{Certainty factor}/\text{Acceptable error})^2$
- Sample Size = $0.25(1.645/0.10)^2 = 68$
- Sample Size = $0.10(1 - 0.10)(1.645/0.10)^2 = 25$

Or if analyst knows 1 in 10 varies from norm.

Certainty factor from certainty table. 10% acceptable error.

Desired Certainty	Certainty Factor
95%	1.960
90	1.645
80	1.281

Sampling Techniques

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

Stratification – 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.

Observation

Observation – 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 - a fact-finding technique that involves a large number of observations taken at random intervals.

Observation

Advantages

- Data gathered can be very reliable
- Can see exactly what is being done in complex tasks
- Relatively inexpensive compared with other techniques
- Can do work measurements

Disadvantages

- People may perform differently when being observed
- Work observed may not be representative of normal conditions
- Timing can be inconvenient
- Interruptions
- Some tasks not always performed the same way
- May observe wrong way of doing things

Observation Guidelines

- Determine the who, what, where, when, why, and how of the observation.
- Obtain permission from appropriate supervisors.
- Inform those who will be observed of the purpose of the observation.
- Keep a low profile.
- Take notes.
- Review observation notes with appropriate individuals.
- Don't interrupt the individuals at work.
- Don't focus heavily on trivial activities.
- Don't make assumptions.

Questionnaires

Questionnaire – a special-purpose document that allows the analyst to collect information and opinions from respondents.

Free-format questionnaire – a questionnaire designed to 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 questionnaire – a questionnaire containing questions that require selecting an answer from predefined available responses.

Questionnaires

Advantages

- Often can be answered quickly
- People can complete at their convenience
- Relatively inexpensive way to gather data from a large number
- Allow for anonymity
- Responses can be tabulated quickly

Disadvantages

- Return rate is often low
- No guarantee that an individual will answer all questions
- No opportunity to reword or explain misunderstood questions
- Cannot observe body language
- Difficult to prepare

Types of Fixed-Format Questions

- Multiple-choice questions
- Rating questions
- Ranking questions

Rank the following transactions according to the amount of time you spend processing them.

- % new customer orders
- % order cancellations
- % order modifications
- % payments

The implementation of quality discounts would cause an increase in customer orders.

- Strongly agree
- Agree
- No opinion
- Disagree
- Strongly disagree

Is the current accounts receivable report that you receive useful?

- Yes
- No

Developing a Questionnaire

1. Determine what facts and opinions must be collected and from whom you should get them.
2. Based on the facts and opinions sought, 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.

Interviews

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

- Find facts
- Verify facts
- Clarify facts
- Generate enthusiasm
- Get the end-user involved
- Identify requirements
- Solicit ideas and opinions

The personal interview is generally recognized as the most important and most often used fact-finding technique.

Types of Interviews and Questions

Unstructured interview –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.

Structured interview –interviewer has a specific set of questions to ask of the interviewee.

Open-ended question – question that allows the interviewee to respond in any way.

Closed-ended question – a question that restricts answers to either specific choices or short, direct responses.

Interviews

Advantages

- Give analyst opportunity to motivate interviewee to respond freely and openly
- Allow analyst to probe for more feedback
- Permit analyst to adapt or reword questions for each individual
- Can observe nonverbal communication

Disadvantages

- Time-consuming
- Success highly dependent on analyst's human relations skills
- May be impractical due to location of interviewees

Procedure to Conduct an Interview

1. Select Interviewees

- End users
- Learn about individual prior to the interview

2. Prepare for the Interview

- interview guide

3. Conduct the Interview

- Summarize the problem
- Offer an incentive for participation
- Ask the interviewee for assistance

4. Follow Up on the Interview

- Memo that summarizes the interview

Sample Interview Guide

Interviewee: Jeff Bentley, Accounts Receivable Manager
 Date: January 19, 2003
 Time: 1:30 P.M.
 Place: Room 223, Admin. Bldg.
 Subject: Current Credit-Checking Policy

Time Allocated	Interviewer Question or Objective	Interviewee Response
1 to 2 min.	Objective Open the interview: <ul style="list-style-type: none"> • 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	

Sample Interview Guide (concluded)

1 min.	<p>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?</p> <p>Follow-up</p>	
1 min.	<p>Question 5 Who are the individuals who perform the credit checks?</p> <p>Follow-up</p>	
1 to 3 min.	<p>Question 6 May I have permission to talk to those individuals to learn specifically how they carry out the credit-checking process?</p> <p>Follow-up If so: When would be an appropriate time to meet with each of them?</p>	
1 min.	<p>Objective Conclude the interview:</p> <ul style="list-style-type: none"> • Thank Mr. Bently for his cooperation and assure him that he will be receiving a copy of what transpired during the interview. 	
21 minutes	Time allotted for questions and objectives	
9 minutes	Time allotted for follow-up questions and redirection	
30 minutes	Time allotted for interview (1:30 p.m. - 2:00 p.m.)	
<p>General Comments and Notes:</p>		

Prepare for the Interview

- Types of Questions to Avoid
 - Loaded questions
 - Leading questions
 - Biased questions
- Interview Question Guidelines
 - 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.

Conduct the Interview

- Dress to match interviewee
- Arrive on time
 - Or early if need to confirm room setup
- Open interview by thanking interviewee
- State purpose and length of interview and how data will be used
- Monitor the time
- Ask follow-up questions
 - Probe until you understand
 - Ask about exception conditions ("what if...")

Interviewing Do's and Don'ts

Do

- Dress appropriately
- Be courteous
- Listen carefully
- Maintain control of the interview
- Probe
- Observe mannerisms and nonverbal communication
- Be patient
- Keep interviewee at ease
- Maintain self-control
- Finish on time

Don't

- Assume an answer is finished or leading nowhere
- Reveal verbal and nonverbal clues
- Use jargon
- Reveal personal biases
- Talk more than listen
- Assume anything about the topic or the interviewee
- Tape record (take notes instead)

Body Language and Proxemics

Body language – the nonverbal information we communicate.

- Facial disclosure
- Eye contact
- Posture

Proxemics – the relationship between people and the space around them.

- 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

Discovery Prototyping

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

Discovery Prototyping

Advantages

- Can experiment to develop understanding of how system might work
- Aids in determining feasibility and usefulness of system before development
- Serves as training mechanism
- Aids in building test plans and scenarios
- May minimize time spent on fact-finding

Disadvantages

- Developers may need to be trained in prototyping
- Users may develop unrealistic expectations
- Could extend development schedule

Joint Requirements Planning

Joint requirements planning (JRP) – 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
- IT Staff

Steps to Plan a JRP Session

1. Selecting a location

- Away from workplace when possible
- Requires several rooms
- Equipped with tables, chairs, whiteboard, overhead projectors
- Needed computer equipment

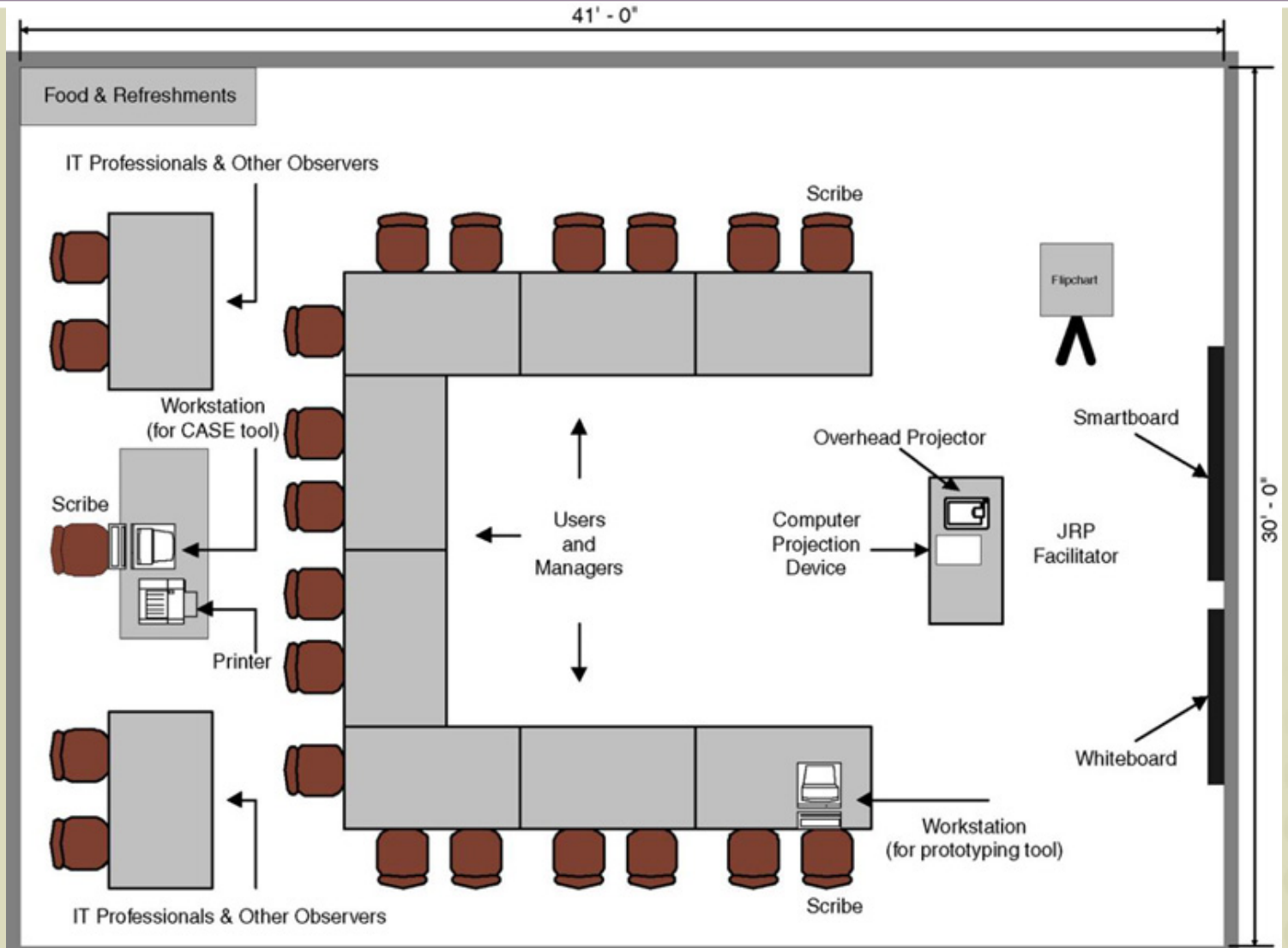
2. Selecting the participants

- Each needs release from regular duties

3. Preparing the agenda

- Briefing documentation
- Agenda distributed before each session

Typical Room Layout for JRP session



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
- Encourage group consensus
- Encourage user and management participation without allowing individuals to dominate the session
- Make sure that attendees abide by the established ground rules for the session

Brainstorming

- Sometimes, one of the goals of a JRP session is to generate possible ideas to solve a problem.
 - Brainstorming is a common approach that is used for this purpose.

Brainstorming – a technique for generating ideas by encouraging participants to offer as many ideas as possible in a short period of time without any analysis until all the ideas have been exhausted.

Brainstorming Guidelines

- Isolate appropriate people in a place that free from distractions and interruptions.
- Make sure everyone understands purpose of the meeting.
- Appoint one person to record ideas.
- Remind everyone of brainstorming rules.
- Within a specified time period, team members call out their ideas as quickly as they can think of them.
- After group has run out of ideas and all ideas have been recorded, then and only then should ideas be evaluated.
- Refine, combine, and improve ideas 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 from existing documents, forms, reports, and files.
2. If appropriate, observe the system in action.
3. Given all the facts that already collected, design and distribute questionnaires to clear up things that aren't fully understood.
4. Conduct interviews (or group work sessions).
5. (Optional). Build discovery prototypes for any functional requirements that are not understood or for requirements that need to be validated.
6. Follow up to verify facts.