Requirement Discovery

Software Engineering & Information System Design

Outline

- Define system requirements
- Understand the concept of requirements management.
- Identify seven fact-finding techniques and characterize the advantages and disadvantages of each.
- Describe a fact-finding strategy that will make the most of your time with end-users.

Introduction

- **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*.

Reasons for Investigating the Current System

- Functionality is required in new system
- Data must be migrated into new system
- Technical documentation provides details of processing algorithms
- Defects of existing system must be avoided
- Parts of existing system may have to be kept
- We need to understand the work of the users
- Baseline information about the existing system helps set targets for the new one

Results of Incorrect Requirements

- More cost.
- Late delivery.
- User dissatisfaction.
- High maintenance and expansion cost.
- Error prone system.
- Reputation of the IT 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 to Define System Requirements

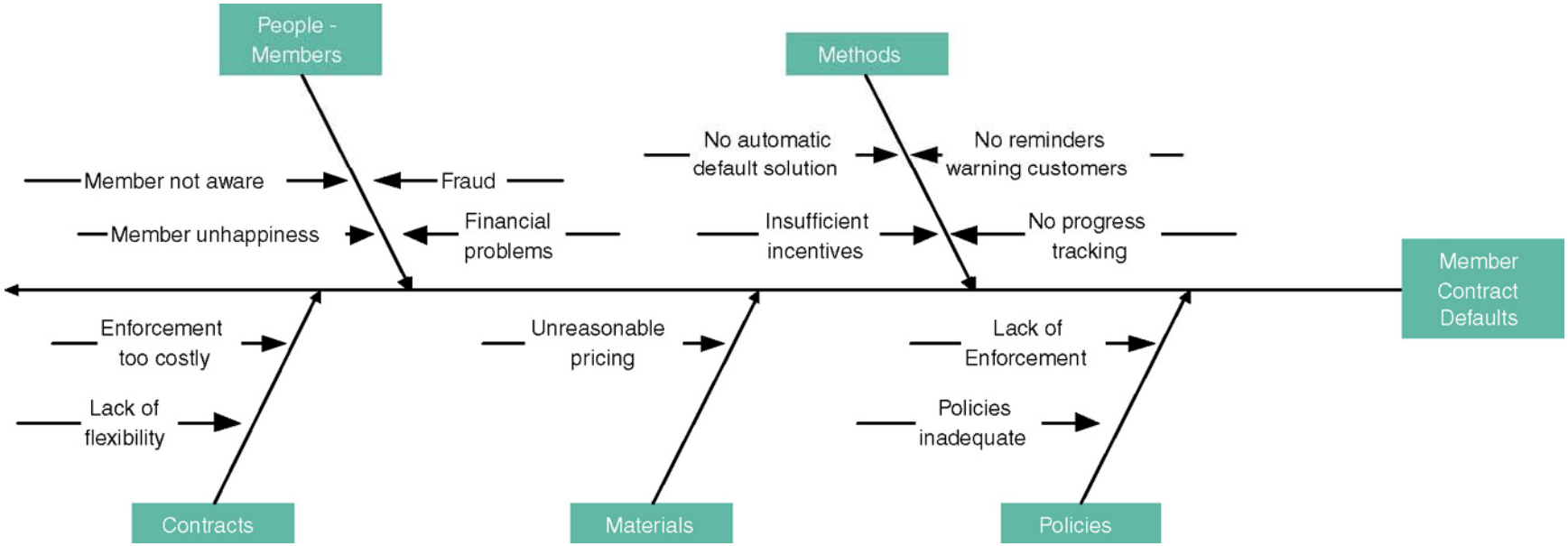
- **Consistent –** not conflicting.
- **Complete –** describes all possible input and responses.
- **Feasible** – can be fulfilled with available resources and constraints.
- **Required** – truly needed for the purpose of the system.
- **Accurate** – stated correctly.
- **Traceable** – directly map to the functions and features of the system.
- **Verifiable** –can be demonstrated during testing.

The Process of Requirements Discovery

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

Ishikawa Diagram (Problem Discovery and Analysis)

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.



Requirements Discovery

- Given an understanding 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*.

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 includes:
  - Systems analysts must not misuse that information.
  - Systems analysts must protect that 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

Documenting and Analyzing Requirements

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

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.

Seven Fact-Finding Methods

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

Background Reading

- Aim is to understand the organization and its business objectives
- Includes:
  - reports
  - organization charts
  - policy manuals
  - job descriptions
  - documentation of existing systems

Background Reading

- **Advantages**:
  - helps to understand the organization before meeting the people who work there
  - helps to prepare for other types of fact finding
  - documentation of existing system may help to identify requirements for functionality of new system
- **Disadvantages**:
  - written documents may be out of date or not match the way the organization really operates
- **Appropriate situations**:
  - analyst is not familiar with organization
  - initial stages of fact finding

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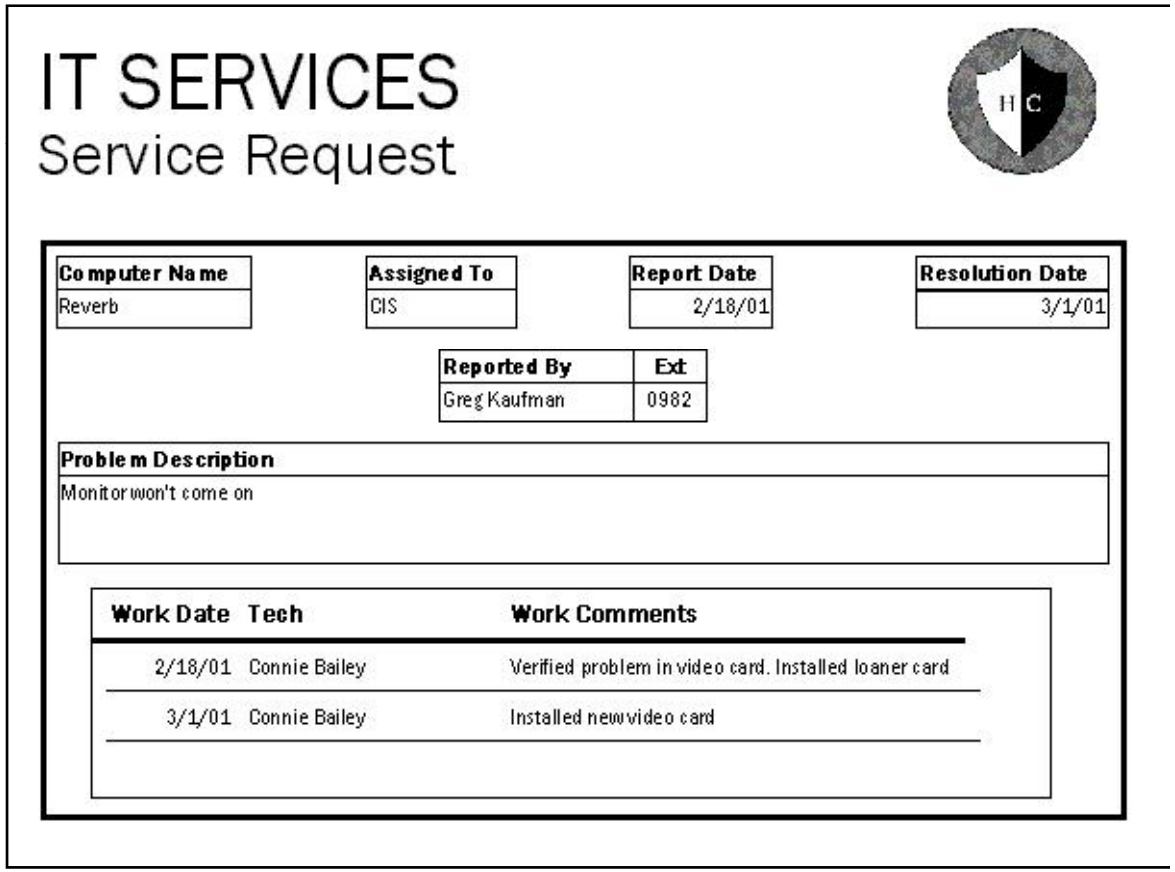
Sampling of Existing Documentation, Forms, and Files

- **Sampling** – the 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

Why to Sample Completed Rather than Blank Forms ?

- Can determine the type of data going into each blank
- Can determine the 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

Sampling of Existing Documentation, Forms, and Files

- Determining the sample size:
  - Sample Size = 0.25 x (Certainty factor/Acceptable error)^2
  - Sample Size = $0.25(1.645/0.10)^2 = 68$
  - Sample Size = $0.10(1 - 0.10)(1.645/0.10)^2 = 25$

Certainty factor from certainty table.
10% acceptable error.

Or if analyst knows 1 in 10 varies from norm.

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.

Sampling Documents

- **Advantages**:
  - for gathering quantitative data
  - for finding out about error rates
- **Disadvantages**:
  - not helpful if the system is going to change dramatically
- **Appropriate situations**:
  - always used to understand information needs
  - where large volumes of data are processed
  - where error rates are high

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Observation

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

- **Work sampling** - 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.

Observation

- **Advantages**:
  - first-hand experience of how the system operates
  - high level of validity of the data can be achieved
  - verifies information from other sources
  - allows the collection of baseline data
- **Disadvantages**:
  - people don't like being observed and may behave differently, distorting the findings
  - requires training and skill
  - logistical problems for the analyst with staff who work shifts or travel long distances
  - ethical problems with personal data

Observation

- **Appropriate situations**:
  - when quantitative data is required
  - to verify information from other sources
  - when conflicting information from other sources needs to be resolved
  - when a process needs to be understood from start to finish

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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.

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.

Questionnaire

- **Advantages**:
  - economical way of gathering information from a large number of people
  - effective way of gathering information from people who are geographically dispersed
  - a well designed questionnaire can be analysed by computer
- **Disadvantages**:
  - good questionnaires are difficult to design
  - no automatic way of following up or probing more deeply
  - postal questionnaires suffer from low response rates

Questionnaire

- **Appropriate situations**:
  - when views of large numbers of people need to be obtained
  - when staff of organization are geographically dispersed
  - for systems that will be used by the general public and a profile of the users is required

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Interviews

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

- Can be used to:
  - 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** – an interview that is 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** – an interview in which the 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 that seems appropriate.

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

Procedure to Conduct an Interview

1. Select Interviewees
   - End users
   - Learn about individual prior to the interview
2. Prepare for the Interview
   - An interview guide is a checklist of specific questions the interviewer will ask the interviewee.
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

Interviewing Do's and Don'ts

Do's	Don'ts
Be courteous	Continuing an interview unnecessarily.
Listen carefully	Assuming an answer is finished or leading nowhere.
Maintain control	Revealing verbal and nonverbal clues.
Probe	Using jargon
Observe mannerisms and nonverbal	Revealing your personal biases
Communication	Talking instead of listening
Be patient	Assuming anything about the topic and the interviewee
Keep interviewee at ease	Tape recording -- a sign of poor listening skills.
Maintain self-control	

Procedure to Conduct an 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.

Communicating With the User

- 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

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

Body Language and Proximities

- **Body language** – the nonverbal information we communicate.
  - Facial disclosure
  - Eye contact
  - Posture

- **Proximities** – 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

Interviewing

- **Advantages**:
  - personal contact allows the interviewer to respond adaptively to what is said
  - it is possible to probe in greater depth
  - if the interviewee has little or nothing to say, the interview can be terminated
- **Disadvantages**:
  - can be time-consuming and costly
  - notes must be written up or tapes transcribed after the interview
  - can be subject to bias
  - if interviewees provide conflicting information this can be difficult to resolve later

Interviewing

- **Appropriate situations**:
  - most projects
  - at the stage in fact finding when in-depth information is required

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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.

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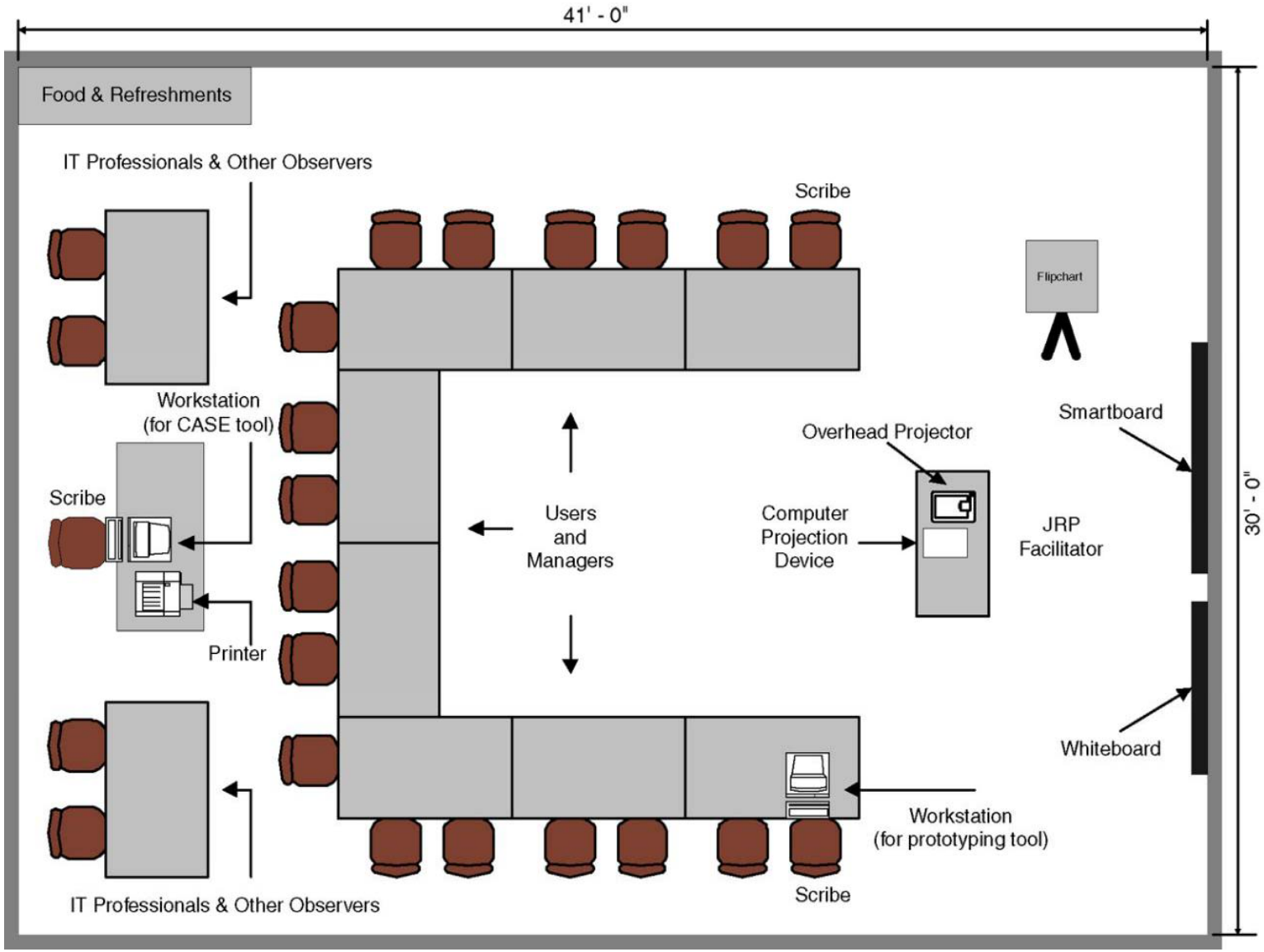
Joint Requirements Planning

- **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 the appropriate people in a place that will be free from distractions and interruptions.
- Make sure everyone understands the 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 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 Complete 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.

The PIECES Problem-Solving Framework

P the need to improve **performance**

I the need to improve **information** (and data)

E the need to improve **economics**, control costs, or increase profits

C the need to improve **control** or security

E the need to improve **efficiency** of people and processes

S the need to improve **service** to customers, suppliers, partners, employees, etc.

Reference

- System Analysis and Design methods – Whitten
  - Chapter 6

Thank You

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Questions