Requirement Elicitation

Chapter 2

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Requirements

- **System requirement**
  - **something that the information system *must do* or a property that it *must have*.**
- **Requirements discovery**
  - **the process and techniques used by systems analysts to identify or extract system problems and solution requirements from the user community.**

Functional vs. Nonfunctional Requirements

- Functional requirement
  - something the information system must do
- Nonfunctional requirement (URPS+)
  - a property or quality the system must have
    - **U**sability: Human Factors, Aesthetics, Consistency, Documentation, Responsiveness
    - **R**eliability: Availability (Failure Frequency (Robustness/Durability/Resilience), Failure Extent & Time-Length (Recoverability/Survivability)), Predictability (Stability), Accuracy (Frequency/Severity of Error)
    - **P**erformance: Speed, Efficiency, Resource Consumption (power, ram, cache, etc.), Throughput, Capacity, Scalability
    - **S**upportability: (Serviceability, Maintainability, Sustainability, Repair Speed) - Testability, Flexibility (Modifiability, Configurability, Adaptability, Extensibility, Modularity), Installability, Localizability
    - +

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

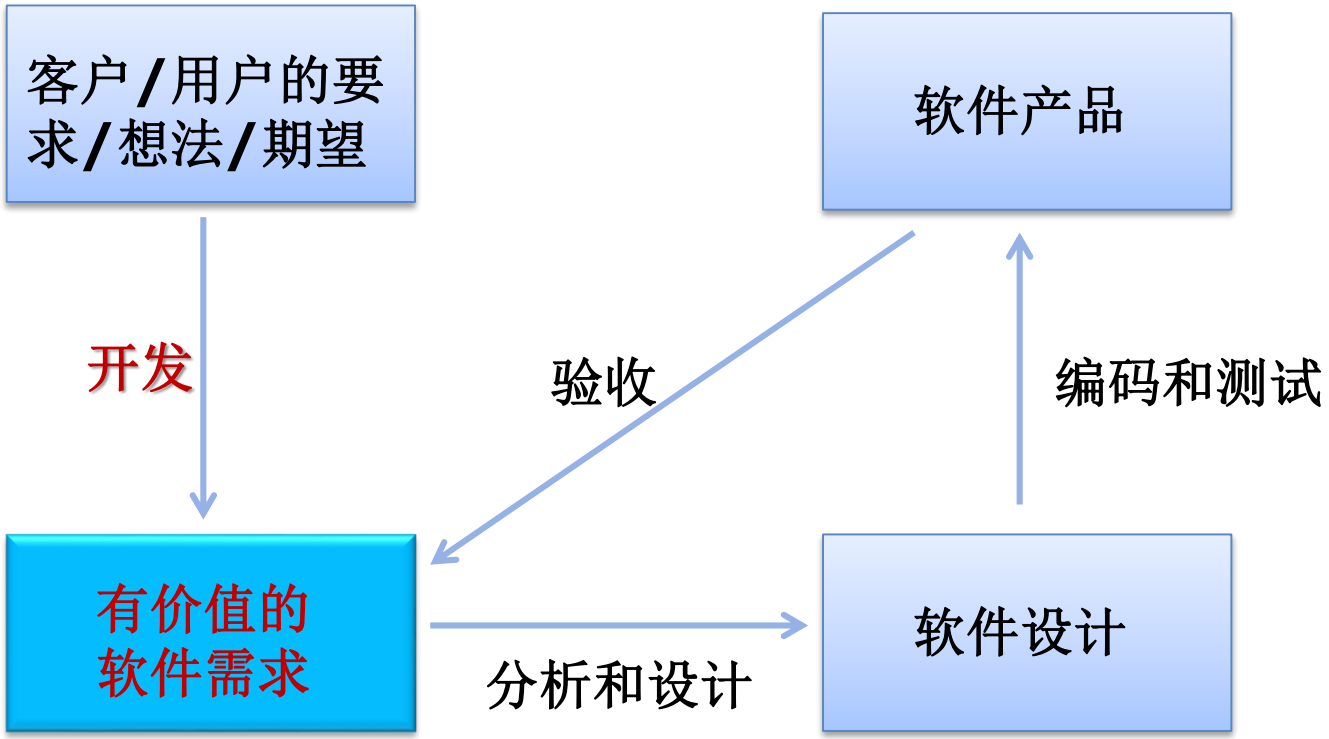
需求难在何处：石头问题

- 我要一块石头...
- 差不多，但我要小一点的...
- 很好，不过我要蓝色的...
- 啊，没有那么小...
- 咳，还是原来那个好了...

难捕获，易变！

小一点的蓝色大理石

需求：也需要开发



Requirement Engineering

- Requirement Engineering - the process of defining, documenting and maintaining requirements in the engineering design process
  - **Requirement Elicitation** – Developers and stakeholders meet, the latter are inquired concerning their needs and wants regarding the software product
  - **Requirement Modeling** - Requirements are identified and conflicts with stakeholders are solved.
  - **System Analysis** (Logical design) – System models to conceptualize and construct systems
  - **Requirement Specification** - Documented in a formal artifact called a Requirement Specification (RS)
  - Requirement Validation
  - Requirement Management

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.

Requirement Elicitation

- Requirement Elicitation is the practice of researching and discovering the requirements of a system from users, customers, and other stakeholders
  - The requirements elicitation process may appear simple: ask the customer, the users and others what the objectives for the system or product are, what is to be accomplished, how the system or product fits into the needs of business, and finally, how the system or product is to be used on a day-to-day basis
  - However, issues may arise that complicate the process.

Requirement Elicitation

- The challenges for requirements elicitation
  - Problems of scope - The boundary of the system is ill-defined or the customers specify unnecessary technical details
  - Problems of understanding - The customers are not completely sure of what is needed, have a poor understanding of the capabilities and limitations of their computing environment, don't have a full understanding of the problem domain, have trouble communicating needs to the system engineer, omit information that is believed to be "obvious," specify requirements that conflict with the needs of other customers, or specify requirements that are ambiguous or untestable.
  - Problems of volatility. The requirements change over time

Requirement Elicitation Technique

- 1. Research existing documentation
- 2. Observations of the work environment
- 3. Interviews
- 4. Workshops
- 5. Prototyping
- 6. Questionnaires

Requirement Elicitation Ethics

- Elicitation 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.
  - 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

Research existing documentation

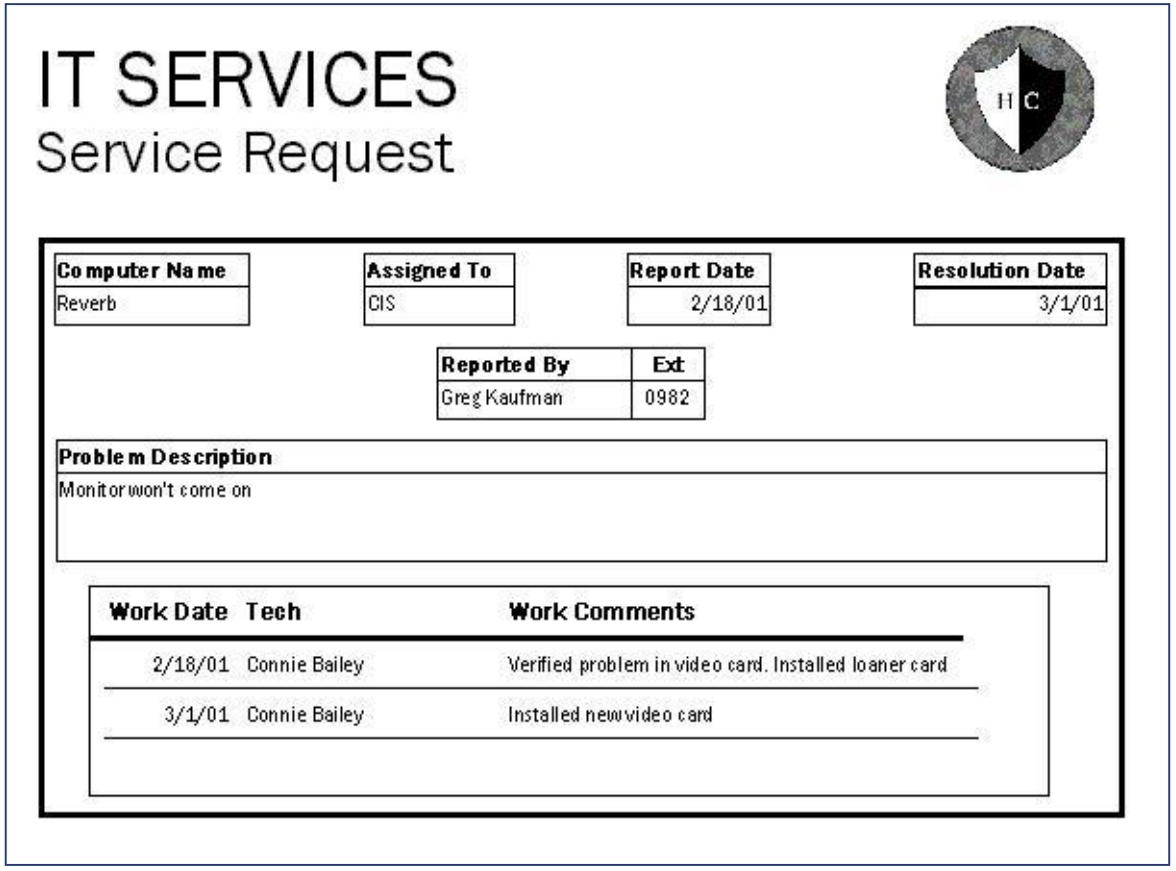
- Collect a representative sample of documents, forms, and records
  - Organization chart
  - Memos and other documents that describe the problem
  - Standard operating procedures for current system
  - Completed forms
  - Manual and computerized screens and reports
  - Samples of databases
  - Flowcharts and other system documentation
  - And more
- Research similar products
  - Competitive analysis

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

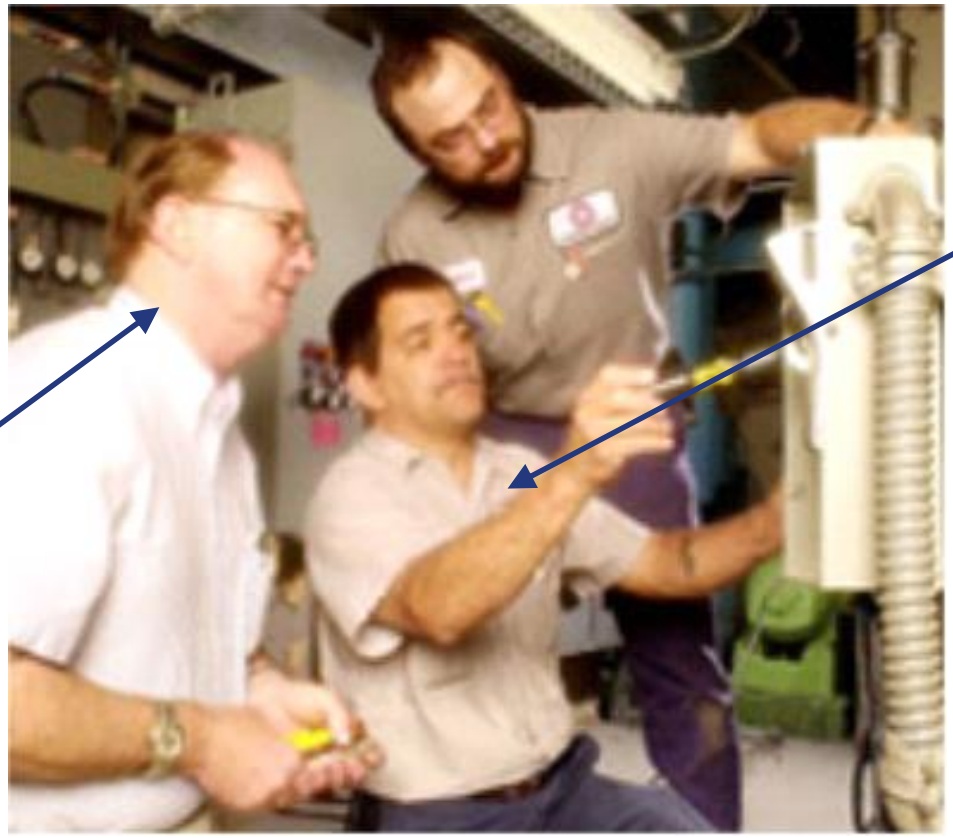
Problem Description
Monitor won't come on

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

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.

2. Observation



Collecting Facts by Observing People at Work

- Observation is the active acquisition of information from a primary source
  - observation employs the senses
  - observation can also involve the recording of data via the use of instruments
- Observations can be qualitative, that is, only the absence or presence of a property is noted, or quantitative if a numerical value is attached to the observed phenomenon by counting or measuring
- Even with a well-conceived observation plan, the systems analyst is not assured that Elicitation will be successful
  - The Railroad Paradox

观察误区：铁路悖论（纯属虚构）

随着北京房价的急速攀升，租房价格也水涨船高，大量的“蚁族”搬离市区，到郊区租住。沙河地区就是这样一个区域，这里住着大量的“码农”等“蚁族”群体，他们每天早上忍受着拥挤不堪的地铁、人满为患的公交，从遥远的沙河去西二旗等地上班，晚上再以同样的方式返回自己的小屋。

一些居住在沙河的“蚁族”们发现，其实在沙河和西二旗附近都有火车站，每天早上都有路过此处的火车进城、晚上也有从城里出来的火车路过。然而由于沙河火车站和西二旗的清河火车站等级太低，这些火车都不在此停车。为此，这些“蚁族”们发起一个签名活动，希望早上进城的火车和晚上出城的火车能够在沙河火车站和清河火车站停车上客，这样他们可以早上坐火车从沙河到清河，晚上再从清河回到沙河。最终有500多人在这份提案上签名，这份提案最终通过一些途径被提交到了***铁路公司，并且也在网上引起了轰动。

观察误区：铁路悖论（纯属虚构）

由于正值全国各级领导响应总书记号召，开展党员学习的敏感时期，铁路公司领导非常重视，成立了专家组论证此事，1个月后，“蚁族”们收到了铁路局的回信：

尊敬的各位沙河居民们：

感谢你们对公司的一贯支持。我们郑重地承诺为住在本公司铁路沿线所有人提供服务，而且愿意接受对本公司各方面反馈意见。对于你们的提案，专家委员会的成员代表在10个不同日子走访了沙河和西二旗车站，均在早高峰7:00 ~ 9:00和晚高峰17:00~19:00。尽管做了十分仔细的观察，但是10次中没有1次看到有任何乘客在此等后过往的火车。

我们只能得出结论，认为没有真正的必要要求火车在这两个车站停靠，因此十分抱歉地拒绝你们的请求。

**铁路公司专家委员会

特别说明：此案例是为了便于大家理解观察的误区，在Jeffrey L. Whitten所著的《系统分析与设计方法》一书的“铁路的悖论”案例基础上改编的而成，纯属虚构，里面的内容纯属虚构，而且有很大的夸张的成分。请勿对号入座！

The Railroad Paradox (cont.)

- The lessons learned from the story:
  - It is necessary to use the appropriate elicitation technique for the problem at hand.
  - Verify Elicitation results with users.

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

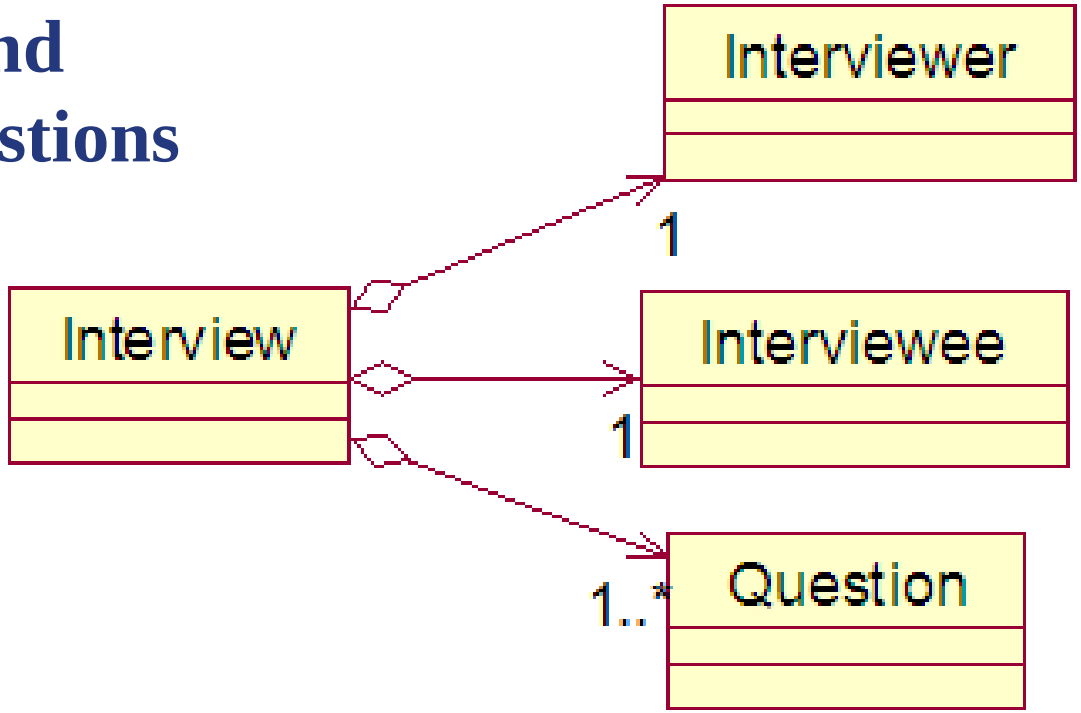
- Determine the who, what, where, when, why, and how of the observation.
- Obtain permission from appropriate supervisors.
- Inform those who will be observed of the purpose of the observation.
- Keep a low profile.
- Take notes.
- Review observation notes with appropriate individuals.
- Don't interrupt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

3. Interviews

- **Interview**
  - a elicitation technique whereby the systems analysts collect information from individuals through face-to-face interaction.
- **Objective**
  - Find facts
  - Verify facts
  - Clarify facts
  - Generate enthusiasm
  - Get the end-user involved
  - Identify requirements
  - Solicit ideas and opinions

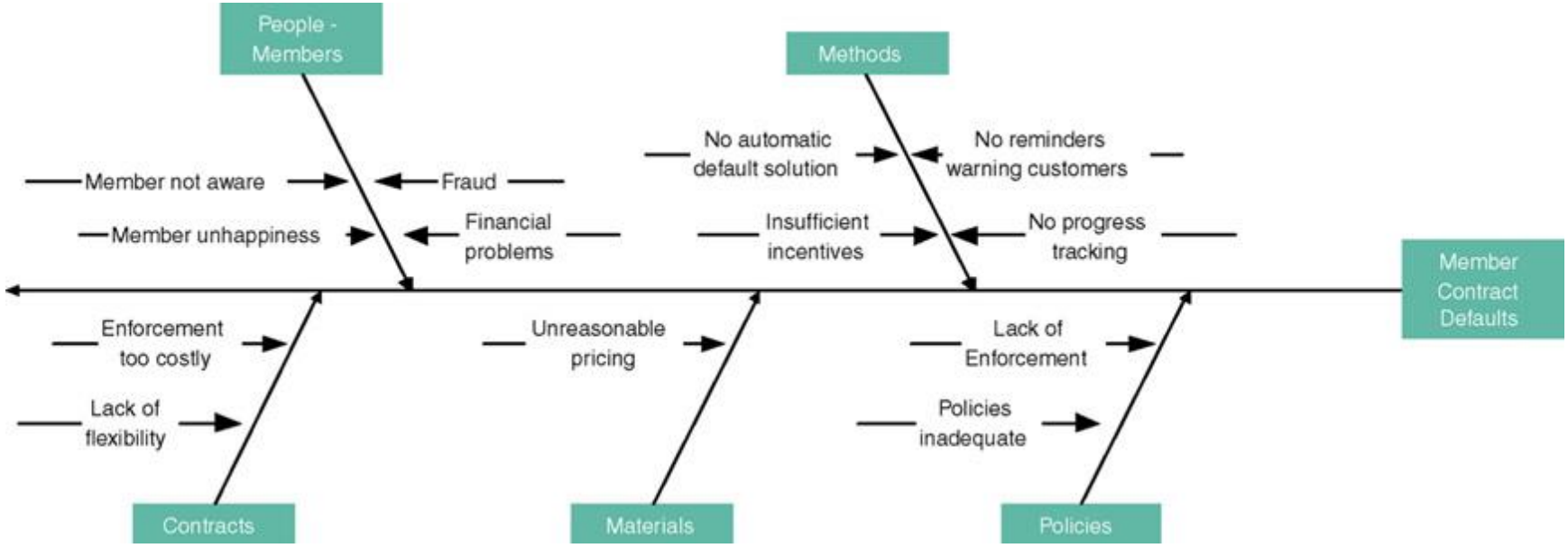
Roles in Interviews

- Interviewer: Systems analyst
  - Responsible for organizing and conducting the interview
- Interviewee: The system user or owner
  - Is asked to respond to a series of questions
- Question



Finding Question: Fishbone Diagram

- Graphical tool used to identify, explore, and depict problems and the causes and effects of those problems, referred to as a cause-and-effect diagram
  - Problem at right (fish head)
  - Possible causes drawn as "bones" off main backbone
  - Brainstorm for 3-6 main categories of possible causes



Design Question: 5W1H

- **5W1H are questions whose answers are considered basic in information gathering or problem solving**
  - **formula for getting the complete story on a subject**
- **According to the principle of the 5W1H, a report can only be considered complete if it answers these questions starting with an interrogative word**
  - **Who was involved?**
  - **What happened?**
  - **Where did it take place?**
  - **When did it take place?**
  - **Why did that happen?**
  - **How did it happen?**
  - **How much is it? //only for engineering (5W2H)**

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

- Select Interviewees
  - End users
  - Learn about individual prior to the interview
- Prepare for the Interview
  - interview guide
- Conduct the Interview
  - Summarize the problem
  - Offer an incentive for participation
  - Ask the interviewee for assistance
- 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: • 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**	

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

4. Workshops

- Workshops - A meeting at which a group of people engage in intensive discussion and activity on a particular subject or project
- Planning the Workshop
  - Define the objective of the workshop
  - Determine the needs of workshop participants
  - Create an outline and preparing supporting materials
  - Assign an estimated length of time to each item on the outline
- Encouraging Workshop Participation
  - Set up the room or space to encourage discussion
  - Incorporate interactive activities
  - Include a question and answer portion

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.

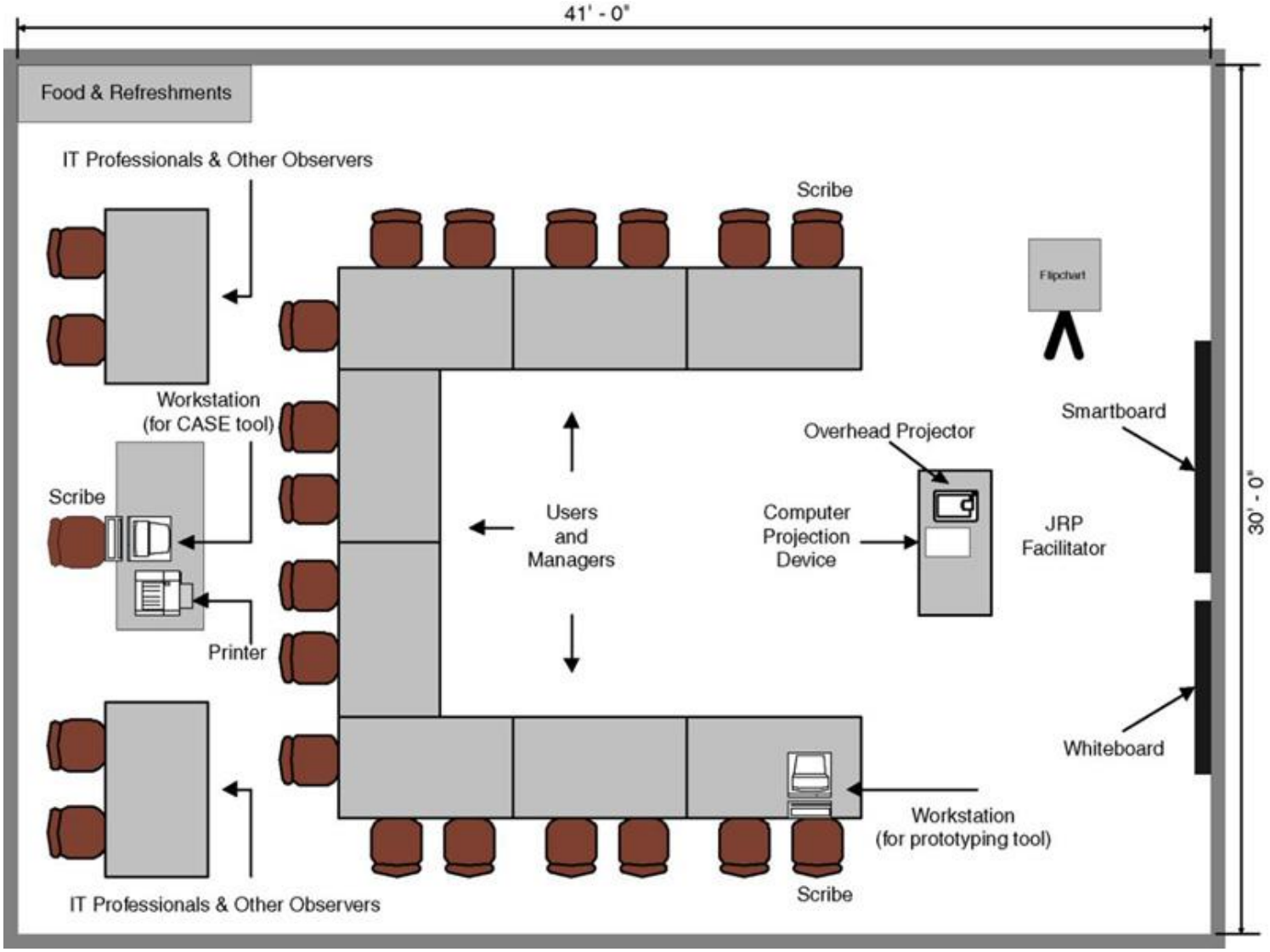
JRP Participants

- Sponsor
  - A single person, is an individual who is in top management.
- Facilitator
  - A single individual for leading all sessions that are held for a systems project.
- Users and Managers
  - The business knowledge to contribute
- Scribes
  - Responsible for keeping records pertaining to everything discussed in the meeting.
- IT Staff
  - Listen and take notes regarding issues and requirements voiced by the users and managers

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



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.

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.

5. 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

- Determine what facts and opinions must be collected and from whom you should get them
- Based on the facts and opinions sought, determine whether free- or fixed-format questions will produce the best answers
- Write the questions
- Test the questions on a small sample of respondents
- Duplicate and distribute the questionnaire

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

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.

6. Prototyping

- **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 Elicitation

Disadvantages

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

Summary

获取技术	使用场合	优点	缺点
收集资料	了解业务流程、规范和标准	不需要用户过多的参与	文档资料与实际业务和未来场景不一致
现场观察	理解用户工作环境	提供最直观的业务细节	耗时，效率低，只能观察现状
访谈	深入探讨业务问题	直接沟通，保证所获得信息的真实性	耗时
开会	征求多方意见	可突出不一致的观点	容易跑题
原型	深入了解业务细节	便于开发方和用户放达成一致理解	耗时，影响后续设计方案的形成
问卷调查	回答特定问题	可以获得匿名答复	问卷表的设计直接影响调查的质量

Practice

- **Practice-01: Requirement Elicitation**
  - 课程案例
    - 网站下载课程案例背景文档，开展课程实践，不得自行选题
  - **Activity:** 使用本节中介绍需求调研方法开展目标系统的需求调研活动
  - **Deliverable：** 按照相应的调研方法设计的需求调研材料（表格、文档等）
  - **Schedule**
    - **Before Sep. 20:** 设计调研材料，开展调研工作，准备课堂讨论资料
    - **Sep. 20：** 讲解调研方案、沟通发现的问题；建议制作ppt
    - **After Sep. 20：** 根据讨论结果，网站调研材料，开展调研活动
  - **Deadline： 2019-09-22, 22:00**
    - 所有的调研材料，均统一打包后提交（由小组负责人提交）

附录1：文档命名和提交规范

- 材料命名规范
  - 小组号（2位）-材料序号（2位）-材料名称-子文档号（2位）-子文档名称.文件扩展名
  - 材料序号和材料名称：01-需求调研，02-需求模型，03-分析模型，04-架构设计，05-数据设计
  - 子文档序号和子文档名称
    - 当某次提交的材料包括多份文档时，每份文档按照先后顺序从01开始编号，并给出合适的名称；如果仅一份文档，则可省略
  - 示例：第01组需求调研中的第2份问卷调查表
    - 01-01-需求调研-02-问卷调查表.doc
  - 打包规范：当某次提交文档超过一份文档时，需要统一打包为一份zip文档，打包后的文件名：小组号-材料序号-材料名称.zip

附录2：文档排版规范

- 请从网站下载文档基本模板，所有Word文档均以该模板为基础，其他类型文档没有具体格式要求
- 有关主体部分的总体格式要求
  - 标题格式：标题1：黑体、三号居中，标题2：黑体四号居左，标题3：黑体小四居左，标题4：黑体五号居左；段落要求：单倍行距，段前0.5行、段后0.5行
  - 文字格式：首行缩进，宋体五号，单倍行距
  - 图表格式：图、表均需有图题、表题，包括编号、名称。采用小5号宋体加粗，居中，编号按照章节编排，如图1-1、图2-1这种形式
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