# Knowledge Elicitation

# What is Knowledge Elicitation?

- Usually project requirements need to be elicited, as thorough discovery of business requirements is rarely readily available at the system analysts' fingertip.
- Business and technical requirements are mostly residing in the minds of stakeholder, and rarely documented somewhere. Therefore, it needs a logical and meticulous methodology.

# What is Knowledge Elicitation?

- Elicitation: the process of learning, uncovering, extracting, surfacing, or discovering needs of customers, users, and other potential stakeholders.
  - The information is sometimes locked away in the heads of domain experts
  - Even experts themselves may not be aware of the implicit conceptual models that they use.
- Examples:
  - Lets take a quick look at the required information to build an application for a hypothetical software.

    *You have been assigned to develop a embedded software for a small device that can be used by elderly people to monitor their medical condition. The device must be in connection with a medical-care center to store the recorded data, send signal to the center and directly to the patient's doctor in case of any medical emergency, etc.*

## Questions that must be answered

- Who are users/associated:
  - Patients ?
  - Doctors?
  - Nurse?
  - Technician?
  - Mangers?
  - Operators
  - Others
- What are peripherals:
  - Alarm system?
  - Wi-Fi?
  - Mobile Phone
- Other systems:
  - banks and credit card institutes?
  - Suppliers?
  - Database servers?

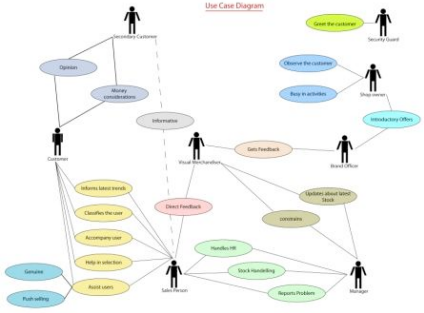
- What are functional requirements
  - Patients to be able to install and uninstall the device.
  - Doctors to view the messages
  - Database to receive the data
  - Doctors to view the patients recorded data
- What are non-functional requirement
  - Usability (easy to install)
  - To be light
  - To be scalable
  - To be secure

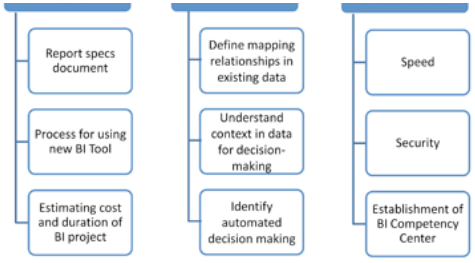
# Elicitation Challenges

- Bias
  - People may not be free to tell you what you need to know
    - Political climate & organizational factors•
- Hidden Agendas
  - People may not want to tell you what you need to know
- Conflicting goals
  - People have different understandings
  - Conflicting understanding
- Thin spread of domain knowledge
  - It might be distributed across many source
- Tacit knowledge:
  - The knowledge that is hard to explain
- (The "say-do" problem)
  - There is significant difference between what people say and what they do
- Limited observability
  - Presence of an observer may change or affect the process

# Knowledge Elicitation Techniques

- Protocol-generation techniques
  - The aim is to produce documents of records of behavior
- Protocol analysis techniques
  - involves the identification of concepts and their relationships, from protocols and documents
- Group discussions and meeting
- Diagram-based techniques
  - Concept map
  - STD
  - Use Case
  - etc
- Hierarchy-generation techniques
  - Laddering techniques (tree like diagrams): Concept ladder, decision ladder
- Matrix-based techniques:
  - Decision Matrix
  - Repertory grid
- Direct Observations



# Required Understanding

- Business objectives, goals, and policies
- Information about people need to do the job
- Data and its movement
  - Places that data rests
  - Sequence and dependencies of data handling activities.
- Rules governing data:
  - Security, sensitivity, back up.
- Key events affecting data.  Eg:
  - Sale of item.
  - New customer
  - New staff

# Required Characteristics

- Question everything.
  - Focus on the essential knowledge
  - Experts can be scarce and valuable.
    - Techniques should take experts off the job for short time period.
- Impartiality
  - Find the best solution.
- Relax Constraints
  - Avoid tradition.
  - Assume anything is possible.
- Attention to details
  - Insist on precise definitions of all aspects of systems requirements.
- Reframing
  - Look at the organization in creative ways.

# Deliverables

- Big piles of document;
  - Transcripts of interviews.
  - Notes on:
    - Observation and analysis of documents.
    - Observation of work.
    - Analysis of forms and reports.
  - Summary analysis of:
    - Questionnaire responses.
    - Job descriptions.
    - Response from prototypes.
  - Documented results of meetings.

# Common Elicitation Techniques

# Interviews

- Types:
  - Structured - agenda of fairly open questions
  - Open-ended - no pre-set agenda
- Advantages
  - Rich collection of information
    - Good for uncovering opinions, feelings, goals, as well as hard facts
  - Can probe in depth, & adapt follow-up questions to what the person tells you
- Disadvantages
  - Large amount of qualitative data can be hard to analyze
  - Hard to compare different respondents
  - Interviewing is a difficult skill to master

***Source:*** *Adapted from Goguen and Linde, 1993, p154.*

# Interviews

- Prepare for the interview:
  - Set up appointment (time, place, and duration).
  - Select an environment free from interruptions.
  - Establish areas of discussion.
  - Establish questions (but be flexible).
  - You may want to provide the interviewer with a list of questions in advance.
- Types of questions:
  - Open ended questions.
  - Closed ended questions.
    - Eg:
      - True / false
      - Multiple choice
      - Ranking / Rating

# Interviews

- Question Guidelines:
  - Do not phrase questions to imply a right or wrong answer.
  - Listen carefully.
  - Take notes, or tape record session (if agreed to by the person being interviewed).
  - Watch body language, reactions, etc.
- Interview follow-up:
  - Summarize and type notes.
  - Organize any additional questions.
  - Identify areas requiring further detail.
  - Send written summary to person interviewed.
  - Thank interviewed person for their time.

# Interviewing Tips

- Starting off…
  - Begin the interview with an innocuous topic to set people at ease
    - e.g. the weather, the score in last night's hockey game
    - e.g. comment on an object on the person's desk: "My,… what a beautiful photograph! Did you take that?"
- Ask if you can record the interview
  - Put the tape recorder in front of interviewer
  - Say that they can turn it off any time
- Ask easy questions first
    - e.g. "How long have you worked in your present position?"
- Follow up interesting leads
    - E.g. if you hear something that indicates your plan of action may be wrong,
- Ask open-ended questions last
    - e.g. "Is there anything else you would like to add?"

# Questionnaires

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- When to be used?
  - to contact a large number of potential system users.
- Main advantage?
  - Often less time consuming and less expensive than interviewing.
- Main challenges?
  - Requires well-designed questions.
  - Must be very precise and clear.
    - Avoid ambiguous questions
    - Remember: person filling out questionnaire has no other source for clarification.
- Typically uses closed-ended questions

# Group Elicitation Techniques

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- Types:
  - Joint/Rapid Application Development
  - (JAD/RAD) Workshops
  - Focus Groups
  - Brainstorming
- Advantages
  - More natural interaction between people than formal interview
  - Synergy may occur
  - Can gauge group reaction
- Disadvantages
  - May create unnatural groups (uncomfortable for participants)
  - **Danger of Groupthink**
  - May only provide superficial responses where detail is needed
  - Requires a highly trained facilitator
- Watch for
  - Sample bias
  - Dominance and submission

# Diagram Based Techniques

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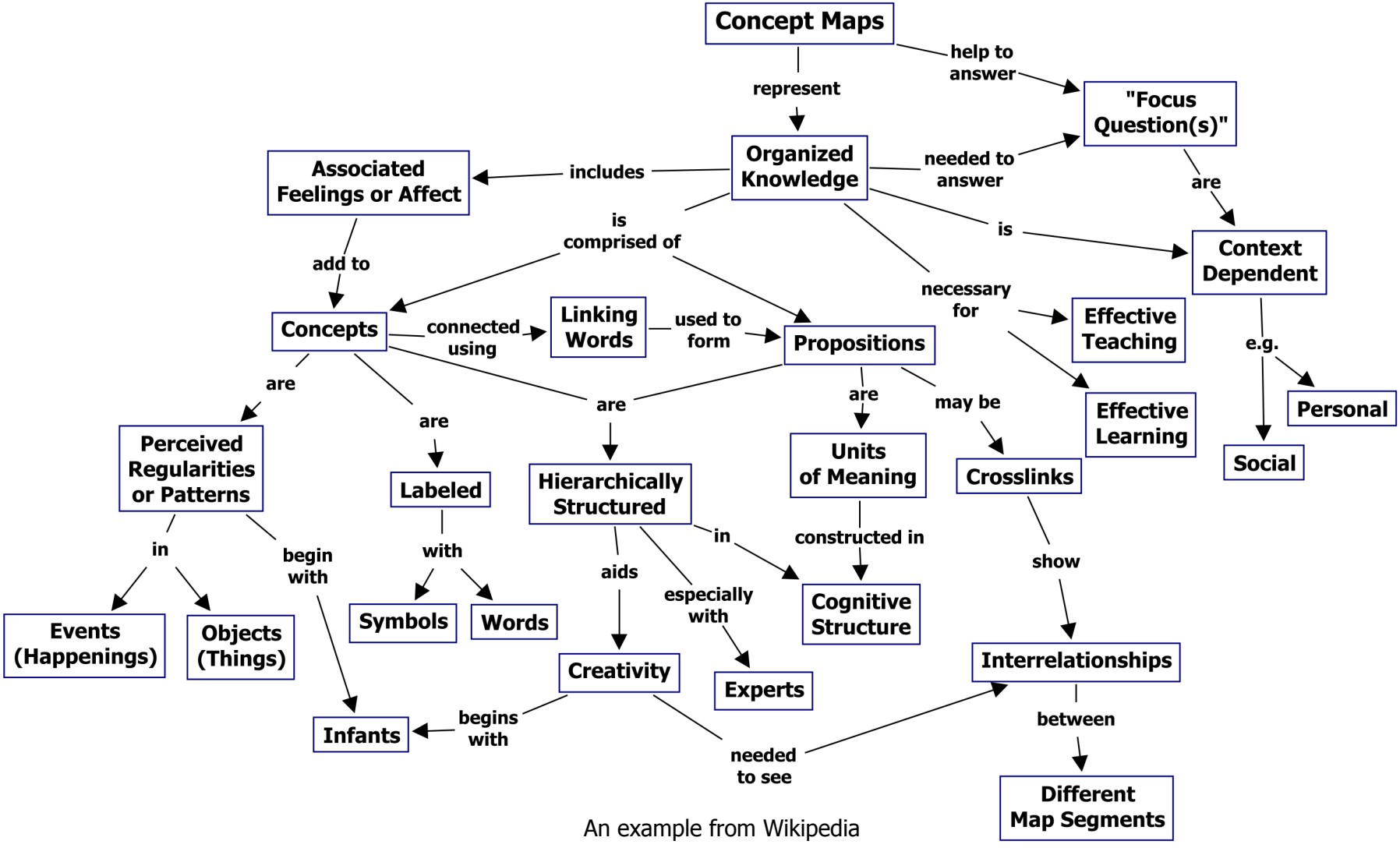
- This group of techniques are most common for modeling purposes and for showing relationships among concepts.
- Examples:
  - Concept map
  - Context diagram
  - Data flow diagram
  - Use case diagarm
  - State transition diagrams
  - Activity diagrams
  - More…

# What is Concept Map

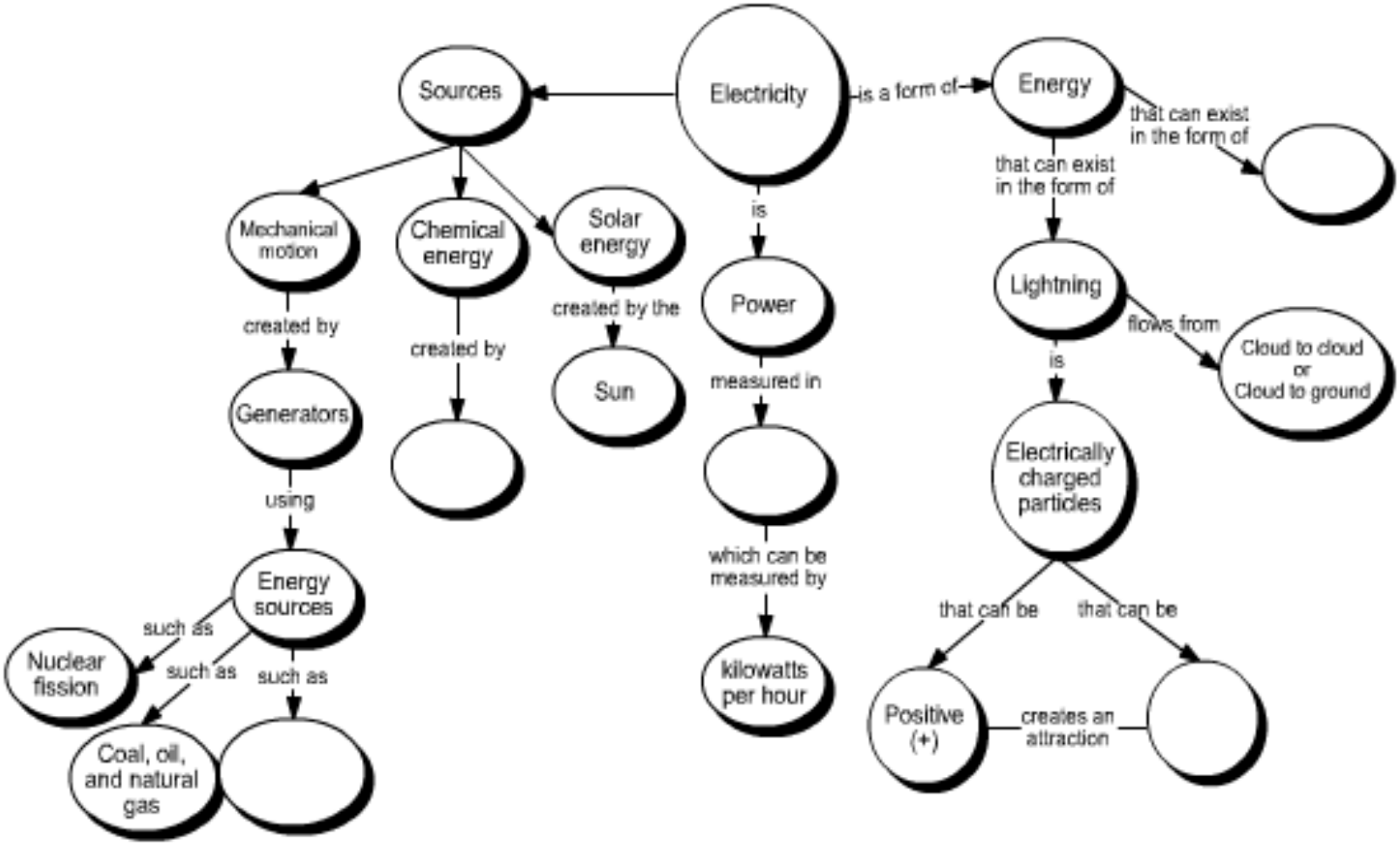
- A concept map is a technique to illustrate the relationships between ideas, concepts, words, definitions, etc.
- It use the same method of sketching a road map to show an address.
- Concept maps are normally used a method of communicating ideas. It also can help to stimulate the generation of ideas, of help creativity.

# Mapping Concept-map




An example from Wikipedia

# Another Example




From: Wikipedia

# Goal-based Approaches

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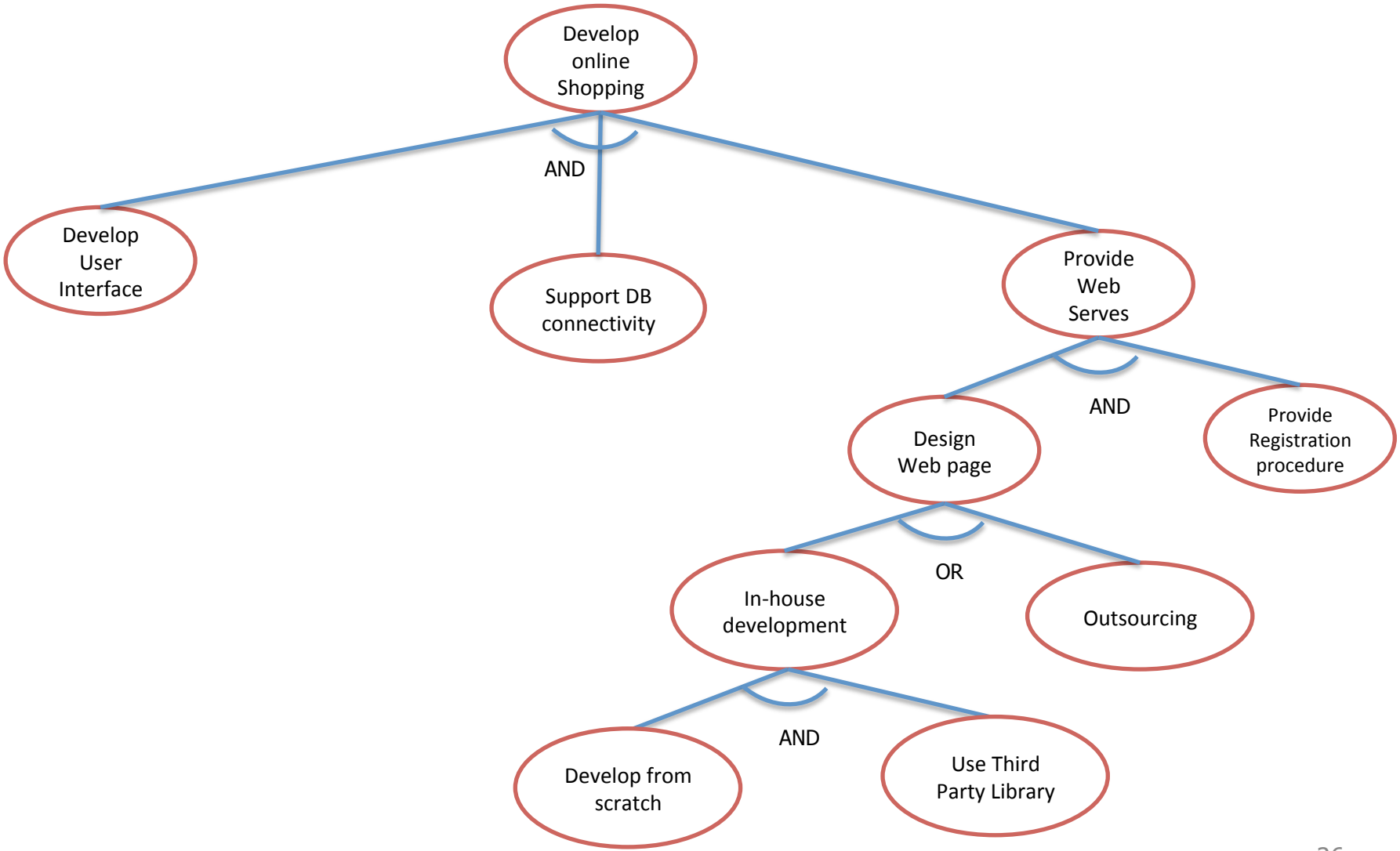
- Approach
  - Focus on why systems are constructed
    - Express the 'why' as a set of stakeholder goals
      - The top-level goal is often "save money" or "make money"
  - Goal hierarchies show refinement and
  - obstacle relationships between goals
- Advantages
  - Reasonably intuitive
  - Sound basis for conflict resolution
- Disadvantages
  - Sometimes not easy to cope with evolution of goals
  - **Can lead to analysis paralysis**

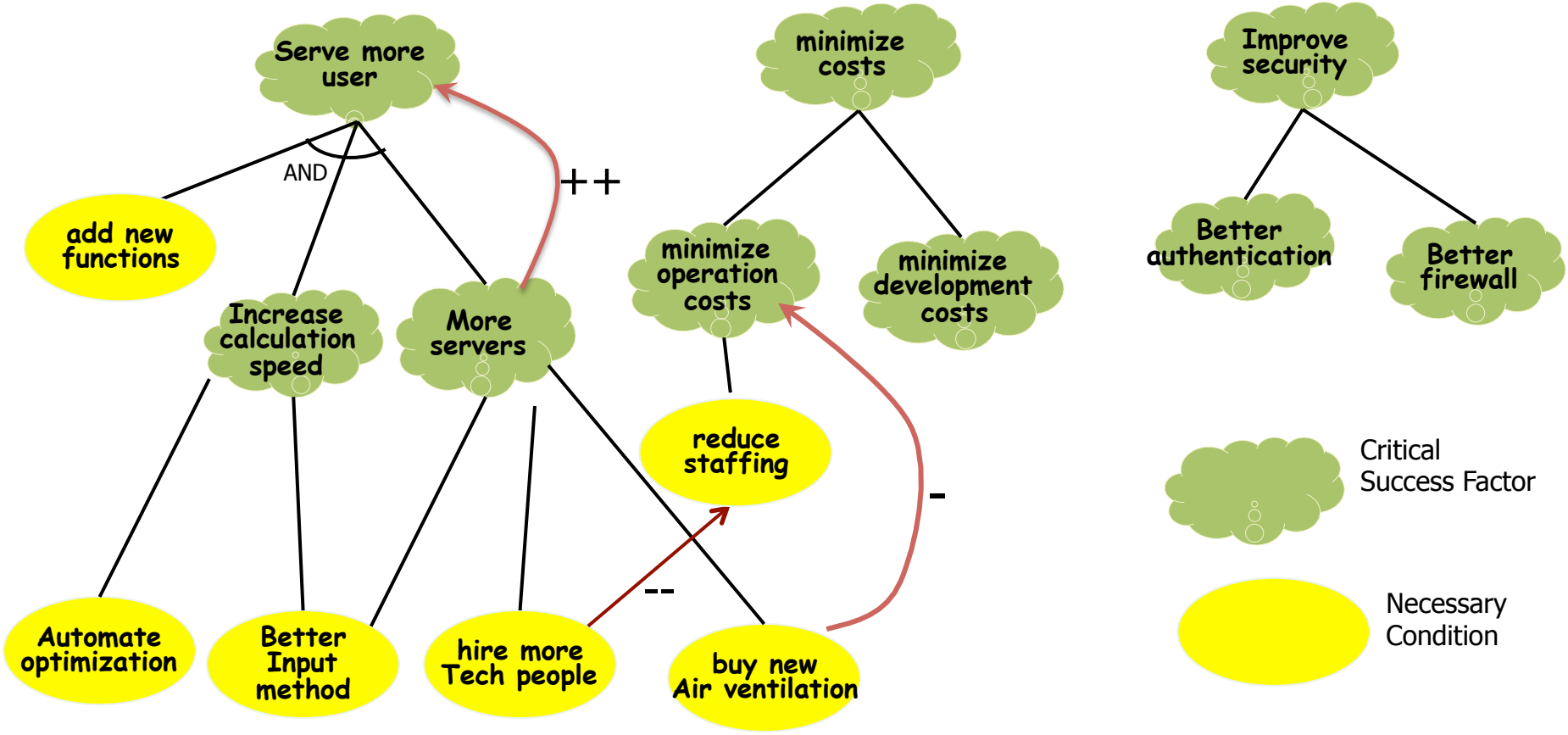
# Using Goal Tree to Obtain and Refine Requirements



# Using Goal Tree to Find Relationships Between Goals

- Three major activities:
  - Goal Elaboration:
    - "Why" questions explore higher goals (context)
    - "How" questions explore lower goals (operations)
    - "How else" questions explore alternatives
  - Relationships between goals:
    - One goal helps achieve another (+)
    - One goal hurts achievement of another (-)
    - One goal makes another (++)
      - Achievement of one goal guarantees achievement of another
    - One goal breaks another (--)
      - Achievement of one goal prevents achievement of another
    - Precedence ordering – must achieve goals in a particular order
  - Obstacle Analysis:
    - Can this goal be obstructed, if so how?
    - What are the consequences of obstructing it?

# A Simplified Example



# Direct Observation

- All other methods depend on the perception of how people think they do their job.
- Some procedures are so routine important details are overlooked.
- “Insignificant details” are overlooked.