Some Knowledge Capturing Techniques

Subsections

- **On-Site Observation (Action Protocol)**
- **Brainstorming**
- **Electronic Brainstorming**
- **Protocol Analysis (Think-Aloud Method)**
- **Consensus Decision Making**
- **Repertory Grid**
- **Nominal Group Technique (NGT)**
- **Delphi Method**
- **Concept Mapping**
- **Blackboarding**

**On-Site Observation (Action Protocol)**

- It is a process which involves observing, recording, and interpreting the expert's problem-solving process while it takes place.
- The knowledge developer does more listening than talking; avoids giving advice and usually does not pass his/her own judgment on what is being observed, even if it seems incorrect; and most of all, does not argue with the expert while the expert is performing the task.
- Compared to the process of interviewing, on-site observation brings the knowledge developer closer to the actual steps, techniques, and procedures used by the expert.
- One disadvantage is that sometimes some experts to not like the idea of being observed.
- The reaction of other people (in the observation setting) can also be a problem causing distraction.
- Another disadvantage is the accuracy/completeness of the captured knowledge.
Brainstorming

- It is an unstructured approach towards generating ideas about creative solution of a problem which involves multiple experts in a session.
- In this case, questions can be raised for clarification, but no evaluations are done at the spot.
- Similarities (that emerge through opinions) are usually grouped together logically and evaluated by asking some questions like:
  - What benefits are to be gained if a particular idea is followed.
  - What specific problems that idea can possibly solve.
  - What new problems can arise through this.

The general procedure for conducting a brainstorming session:

- Introducing the session.
- Presenting the problem to the experts.
- Prompting the experts to generate ideas.
- Looking for signs of possible convergence.

- If the experts are unable to agree on a specific solution, then knowledge developer may call for a vote/consensus.

Electronic Brainstorming

- It is a computer-aided approach for dealing with multiple experts.
- It usually begins with a pre-session plan which identifies objectives and structures the agenda, which is then presented to the experts for approval.
- During the session, each expert sits on a PC and get themselves engaged in a predefined approach towards resolving an issue, and then generates ideas.
- This allows experts to present their opinions through their PC’s without having to wait for their turn.
- Usually the comments/suggestions are displayed electronically on a large screen without identifying the source.
- This approach protects the introvert experts and prevents tagging comments to individuals.
- The benefit includes improved communication, effective discussion regarding sensitive issues, and closes the meeting with concise recommendations for necessary action (refer to Figure 5.1 for the sequence of steps).
- This eventually leads to convergence of ideas and helps to set final specifications.
- The result is usually the joint ownership of the solution.

![Diagram of the process of brainstorming]

**Figure 5.1**: The process of brainstorming

## Protocol Analysis (Think-Aloud Method)

- In this case, protocols (scenarios) are collected by asking experts to solve the specific problem and verbalize their decision process by stating directly what they think.
- Knowledge developers do not interrupt in the interim.
- The elicited information is structured later when the knowledge developer analyzes the protocol.
- Here the term *scenario* refers to a detailed and somehow complex sequence of events or more precisely, an episode.
- A scenario can involve individuals and objects.

A scenario provides a concrete vision of how some specific human activity can be supported by information technology.
Consensus Decision Making

- Consensus decision making usually follows brainstorming.
- It is effective if and only if each expert has been provided with equal and adequate opportunity to present their views.
- In order to arrive at a consensus, the knowledge developer conducting the exercise tries to rally the experts towards one or two alternatives.
- The knowledge developer follows a procedure designed to ensure fairness and standardization.
- This method is democratic in nature.
- This method can be sometimes tedious and can take hours.

Repertory Grid

- This is a tool used for knowledge capture.
- The domain expert classifies and categorizes a problem domain using his/her own model.
- The grid is used for capturing and evaluating the expert's model.
- Two experts (in the same problem domain) may produce distinct sets of personal and subjective results.
- The grid is a scale (or a bipolar construct) on which elements can be placed within gradations.
- The knowledge developer usually elicits the constructs and then asks the domain expert to provide a set of examples called elements.
- Each element is rated according to the constructs which have been provided.

Nominal Group Technique (NGT)

- This provides an interface between consensus and brainstorming.
- Here the panel of experts becomes a Nominal Group whose meetings are structured in order to effectively pool individual judgment.
- Ideawriting is a structured group approach used for developing ideas as well as exploring their meaning and the net result is usually a written report.
- NGT is an ideawriting technique.
Delphi Method

- It is a survey of experts where a series of questionnaires are used to pool the experts' responses for solving a specific problem.
- Each experts' contributions are shared with the rest of the experts by using the results from each questionnaire to construct the next questionnaire.

Concept Mapping

- It is a network of concepts consisting of nodes and links.
- A node represents a concept, and a link represents the relationship between concepts (refer to Figure 6.5 in page 172 of your textbook).
- Concept mapping is designed to transform new concepts/propositions into the existing cognitive structures related to knowledge capture.
- It is a structured conceptualization.
- It is an effective way for a group to function without losing their individuality.
- Concept mapping can be done for several reasons:
  o To design complex structures.
  o To generate ideas.
  o To communicate ideas.
  o To diagnose misunderstanding.
- Six-step procedure for using a concept map as a tool:
  o Preparation.
  o Idea generation.
  o Statement structuring.
  o Representation.
  o Interpretation
  o Utilization.
- Similar to concept mapping, a semantic net is a collection of nodes linked together to form a net.
  o A knowledge developer can graphically represent descriptive/declarative knowledge through a net.
  o Each idea of interest is usually represented by a node linked by lines (called arcs) which shows relationships between nodes.
  o Fundamentally it is a network of concepts and relationships (refer to page 173 of your textbook for example).

Blackboarding
• In this case, the experts work together to solve a specific problem using the blackboard as their workspace.
• Each expert gets equal opportunity to contribute to the solution via the blackboard.
• It is assumed that all participants are experts, but they might have acquired their individual expertise in situations different from those of the other experts in the group.
• The process of blackboarding continues till the solution has been reached.
• Characteristics of blackboard system:
  o Diverse approaches to problem-solving.
  o Common language for interaction.
  o Efficient storage of information
  o Flexible representation of information.
  o Iterative approach to problem-solving.
  o Organized participation.
• Components of blackboard system:
  o The Knowledge Source (KS): Each KS is an independent expert observing the status of the blackboard and trying to contribute a higher level partial solution based on the knowledge it has and how well such knowledge applies to the current blackboard state.
  o The Blackboard: It is a global memory structure, a database, or a repository that can store all partial solutions and other necessary data that are presently in various stages of completion.
  o A Control Mechanism: It coordinates the pattern and flow of the problem solution.
• The inference engine and the knowledge base are part of the blackboard system.
• This approach is useful in case of situations involving multiple expertise, diverse knowledge representations, or situations involving uncertain knowledge representation.

**Knowledge Codification**

• Knowledge codification means converting tacit knowledge to explicit knowledge in a usable form for the organizational members.
• Tacit knowledge (e.g., human expertise) is identified and leveraged through a form that is able to produce highest return for the business.
• Explicit knowledge is organized, categorized, indexed and accessed.
• The organizing often includes decision trees, decision tables etc.
• Codification must be done in a form/structure which will eventually build the knowledge base.
• The resulting knowledge base supports training and decision making.
  o Diagnosis.
  o Training/Instruction.
  o Interpretation.
  o Prediction.
  o Planning/Scheduling.
• The knowledge developer should note the following points before initiating knowledge codification:
  o Recorded knowledge is often difficult to access (because it is either fragmented or poorly organized).
  o Diffusion of new knowledge is too slow.
  o Knowledge is not shared, but hoarded (this can involve political implications).
  o Often knowledge is not found in the proper form.
  o Often knowledge is not available at the correct time when it is needed.
  o Often knowledge is not present in the proper location where it should be present.
  o Often the knowledge is found to be incomplete.

Subsections

• **Modes of Knowledge Conversion**
• **Codifying Knowledge**
• **Codification Tools/Procedures**
  o Knowledge Maps
  o Decision Table
  o Decision Tree
  o Frames
  o Production Rules
  o Case-Based Reasoning
  o Knowledge-Based Agents

**Modes of Knowledge Conversion**

• Conversion from tacit to tacit knowledge produces socialization where knowledge developer looks for experience in case of knowledge capture.
• Conversion from tacit to explicit knowledge involves externalizing, explaining or clarifying tacit knowledge via analogies, models, or metaphors.
• Conversion from explicit to tacit knowledge involves internalizing (or fitting explicit knowledge to tacit knowledge).
• Conversion from explicit to explicit knowledge involves combining, categorizing, reorganizing or sorting different bodies of explicit knowledge to lead to new knowledge.

Codifying Knowledge

• An organization must focus on the following before codification:
  o What organizational goals will the codified knowledge serve?
  o What knowledge exists in the organization that can address these goals?
  o How useful is the existing knowledge for codification?
  o How would someone codify knowledge?
• Codifying tacit knowledge (in its entirety) in a knowledge base or repository is often difficult because it is usually developed and internalized in the minds of the human experts over a long period of time.

Knowledge Developer's Skill Set

Subsections

- Knowledge Requirements
- Skills Requirements

Knowledge Requirements

• Computing technology and operating systems.
• Knowledge repositories and data mining.
• Domain specific knowledge.
• Cognitive psychology.

Skills Requirements

• Interpersonal Communication.
• Ability to articulate the project’s rationale.
• Rapid Prototyping skills.
• Attributes related to personality.
• Job roles.