

Methods for Eliciting Strategic Knowledge (Tables)

The methodologies below were compiled by Cannon -Bowers, & Blickensderfer (1993) in cooperation with NATO Defense Group.

Critical Decision Method 1 (Interview) (Method for Eliciting Strategic Knowledge)

Description	(1) Interview expert to identify (a) non-routine events that challenged expertise and (b) events for which expertise made a significant difference. (2) Construct a time line of events. (3) Probe key points further.
Type of Representation	Goals considered during incident; options generated, evaluated, & chosen; cue utilization; contextual elements; situation assessment factors specific to particular decisions, decision strategies
Subprocess in Decision Making/Application	Working memory: schema, mental model, perceived situation; Processes: assess/understand, evaluate, meta-cognition
Knowledge Type/Nature	Declarative/Indirect method
Strengths	Strategic (decision strategies, critical cues, situation assessment, goals/intent, expectancies, mental simulation strategies and improvisation/ Direct
Limitations	Requires knowledge engineer trained in interviewing. Relies a certain degree on expert's memory
Sources	Thordsen (1991); Also see Klein, Calderwood & McGregor (1989)

Critical Decision Method 2-CDM (Interview) (Method for Eliciting Strategic Knowledge)

Description	Semi-structured interview using specific probes designed to elicit particular type of information. Examine data for perceptual cues, judgment details, and decision strategy details that are not generally captured with traditional reporting method.
Type of Representation	Decision Strategies
Subprocess in Decision Making/Application	Working memory: schema, mental model, perceived situation. Processes: assess/understand, evaluate, meta-cognition
Knowledge Type/Nature	Strategic (goal options, cue utilization, contextual elements, situation assessment factors)./Direct
Strengths	Yields information of richer variety, specificity, and quantity than typically available in experts' verbal reports (Crandall, 1989)
Limitations	Requires knowledge engineer trained in interviewing; reliance on recollection ignores human's mediocre recollection; other problems associated with interview (Converse & Kahler, 1992).
Other Sources	Crandall & Klein (1990)

Decision Graph (Software) (Method for Eliciting Strategic Knowledge)

Description	Expert uses graphical interface to create a decision graph
Type of Representation	Decision Graph Tree
Subprocess in Decision Making/Application	
Knowledge Type/Nature	Strategic / Direct
Strengths	Knowledge engineer does not need to be present during knowledge acquisition, no translation of knowledge required
Limitations	Cannot handle novel situations (Rodi, Pierce, & Dalton, 1989); requires computer and software, expert must be familiar with graphic interface (Converse & Kahler 1992)
Other Sources	Rodie, Pierce, & Dalton (1989)

Goal Directed Analysis (Method for Eliciting Strategic Knowledge)

Description	Technique is designed to map the relationship between parts, how evidence testifies the state of these parts and how each can change as a function of the state of the domain. Knowledge is gathered from multiple sources including interviews, documents, observations and simulations. Goal-means network created.
Type of Representation	Goal-means Network (functional interrelationship); Structure of domain task in terms of goals, relationships between goals, and the means to achieve goals.
Subprocess in Decision Making/Application	Knowledge structure: goals, relationships, strategies, schema. Processes: assess/understand, evaluate
Knowledge Type/Nature	Strategic (knowledge from specialists and simulations). Procedural (knowledge from documents, observations, interviews)/ Direct
Strengths	Networks characterize types of problems solved in a domain and how human performance affects those problems. Networks provide a framework to discover problems that can arise and kinds of information processing requirements. Can identify points in the process where multiple interpretations and errors may occur
Limitations	Results may depend on knowledge source (Converse & Kahler, 1992)
Other Sources	Woods & Holinagel (1987)

Policy Capturing (Ratings) (Method for Eliciting Strategic Knowledge)

Description	General procedure designed to describe statistically the unique information processing strategies of individual raters. Expert rates performance profiles. Regression analysis used to objectively demonstrate the expert's combinations and weights of the information.
Type of Representation	Information weights
Subprocess in Decision Making/Application	Knowledge structure: relationships. Processes: monitors/sense, evaluate
Knowledge Type/Nature	Strategic (element importance and applications) / Indirect
Strengths	Can use this method to build a domain model before using specific knowledge acquisition tools.
Limitations	Requires cognosis software and computer hardware.
Source	Woodward (1990)

Policy Capturing (Ratings)(2) (Method for Eliciting Strategic Knowledge)

Description	Policy capturing explicates the relative weights, functional forms, and the strategy for combining environmental information sources (cues) into a summary judgment (Hammond, Mumpower, & Smith, 1977 cf, Dougherty & Callendar, 1986). Expert rates a hypothetical case or person. Data identifies judgment structures and tendencies, relative weights, and functional forms. Multiple regression equation uses information cue values to predict decision judgments. Multiple regression equation weights reveal unique elements.
Type of Representation	Information weights
Subprocess in Decision Making/Application	Knowledge structure: relationships. Processes: monitor/sense, evaluate
Knowledge Type/Nature	Strategic / Indirect
Strengths	Extracts expert's policy (i.e., decision making strategy) using actual decisions as input
Limitations	Raters evaluate hypothetical cases (Doughty & Calendar, 1986). Requires computer and software. Requires knowledge engineer trained in policy capturing. Raters judge appropriateness of policies but raters have been shown to have little insight into the policies (Converse & Kahler, 1992)
Other Sources	Dougherty & Callender (1986)

Storyboarding (Interview) (Method for Eliciting Strategic Knowledge)

Description	Storyboarding prototyping provides a medium within which to transform the language-based representations inherent in concept mapping and IDEF modeling into an object-oriented design. Allows expert to experience the prototype design.
Type of Representation	A prototype display design based on Task/Action Mapping. Display design: Expert illustrates on paper what he/she needs on the display surface during the performance of the mission. Expert identifies what is needed on a display to support a decision point.
Subprocess in Decision Making/Application	Knowledge structure: concepts/categories, relationships, and schema. Working memory: mental model. Processes: monitor/sense, search and reason.
Knowledge Type/Nature	Strategic (Information requirements and display element relationship to task actions) / Direct
Strengths	Storyboarding gives expert the opportunity to translate his/her conceptual knowledge and expertise into a representation and design prototype which could be perceptually experienced by other viewers of the storyboard.
Limitations	Appropriate for visually-oriented tasks; specific to display design.
Sources	McNeese & Zaff (1991)

Tasking Action Mapping (Method for Eliciting Strategic Knowledge)

Description	Expert identifies goals, subgoals, and actions needed to complete each task element of a decision flow diagram. Decision flow diagram then translated into a rule-based representation, with each goal and subgoal broken into action sequence
Type of Representation	Decision flow diagram is translated into a more rule-based representation. Goals & subgoals are decomposed in action sequences. Purpose of action sequence is to provide a procedural description of system specific actions required to accomplish the task.
Subprocess in Decision Making/Application	Knowledge structure: schema, rules, goals. Working memory: mental model. Processes: assess/understand, evaluate
Knowledge Type/Nature	Strategic (novel, knowledge-based situations). Procedural (familiar, rule-based situations)/ Direct
Strengths	Action sequences provide the level of detail necessary to specify the interactions that must occur at the system level for the user's task to be accomplished.
Limitations	Requires knowledge engineer trained in creating task action mappings (Converse & Kahler, 1992)
Sources	Coury, Motte & Selford (1991)

User Needs Analysis (Method for Eliciting Strategic Knowledge)

Description	Approach to design information system that identifies the information needs of the user, reveals the reasoning process & decision strategies employed by users to make decisions, and represents those processes and information requirements in such a way as to enhance system development. User needs analyses and current management practices used to create models of decision process and data flow diagrams for specific tasks.
Type of Representation	Decision process diagrams
Subprocess in Decision Making/Application	Knowledge structure: concepts/categories goals, schema, rules, relationships, strategies. Working memory: mental models, perceived situation. Processes: monitor/sense, assess/understand, evaluate, meta-cognition
Knowledge Type/Nature	Strategic (novel situations). Procedural (familiar situations)/ Direct
Strengths	User needs analysis identifies data and information required for the topic, determines availability of data, and reveals functional and organizational among users. User needs analysis combined with cognitive modeling provides an extremely useful method for capturing and incorporating the decision processes of users in the design of information systems. When based on user analysis, cognitive models provide a user centered approach to developing decision models for information processing systems. The cognitive models structure and organize decision strategies and produce decision models for a system that is congruent with the user's model of the decision problem.
Limitations	Requires knowledge engineer trained in creating decision flow diagrams (Converse & Kahler, 1992).
Other Sources	Coury, Motte & Selford (1991)

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