

Table 1.

Knowledge elicitation methods and their major advantages and disadvantages.

Method	Brief Description	Major Advantages	Major Disadvantages
Interviews	Interviewer asks the expert or end-user questions relating to a specific topic	-Most well-known method for eliciting knowledge -Qualitative data	-Time consuming -Expensive
Verbal Protocol Analysis	Experts report thought processes involved in performing a task or solving a problem	-Qualitative data -Document thought processes related to performance	-Time-consuming -Hard to analyze
Group Task Analysis	A group of experts describes and discusses processes pertaining to a specific topic	-Obtain different viewpoints -Document thought processes and information related to performance	-No research validating this method
Narratives, Scenarios, and Critical Incident Reports	The expert or end-user constructs stories to account for a set of observations	-Provide insight to reasoning processes and implicit knowledge -Good for ill-defined problems	-Reliance on self-reports
Questionnaires	User Groups report information or preferences relating to a topic	-Quantitative data -Easy to code	-Low return rate -Response may not correspond with actual behavior
Focus Groups	A group of users discusses different issues regarding the features of a system	-Allows exchange of ideas -Good for generating lists of functions and features for products	-An individual may dominate the discussion -Not good for discovering specific problems
Wants and Needs Analysis	User Groups/Experts brainstorm about content they want and need in a system	-Exchange of ideas -Determine areas of focus -Prioritized list of functions and features	-What users say they want and need may not be realistic
Observation and Contextual Inquiries	Observe as users interact with a product in a natural environment	-Studied in natural environment -Qualitative and quantitative data	-Time-consuming -Dependent on detailed notes of the observer
Ethnographic Studies	User culture and work environment are observed	-Studied in natural environment -Good for discovering new products	-Time-consuming -Hard to generalize results to other product designs
User Diary	Users record and evaluate actions over a period of time	-Real-time tracking -Qualitative data	-Can be invasive or difficult to implement -May be delay in entries by users
Concept Sorting	Users/experts establish relations among a fixed set of concepts	-Determine relations among components -Helps structure information	-Grouping may not be optimal -Resulting structure may be too elaborate
Log Files	Users' behaviors are logged to understand the users' interactions with the system	-Uses actual recorded behaviors -Can collect data from a range of users	-Irrelevant or wrong information may be recorded -Data do not reflect cognitive processes

Table 2.

Methods for structuring and organizing information on the Web, and their major advantages and disadvantages.

Method	Brief Description	Major Advantages	Major Disadvantages
Hyperlinks	A pointer that takes the user to a different location of the site	-Allows access to same information from multiple locations	-Users can get lost
Extensible Markup Language (XML)	A tool to specify the content and structure of information	-Imposes constraints on storage and structure of information -Provides a good schema for organizing information	-Not accepted as the standard language -Designers must still organize the information
Semantic Web	Link information based on its properties	-Can gather information about a site from the owner or other users -Make comments about a site	-Requires common vocabulary and rules.
Interactive Navigation Display	Use navigation to inform users where they are in the site, how they got there, and how to get back	-Help users learn about the structure and organization of the Web site	-Users' expertise may be a factor -Not available on every site
User-Interface Standards	Suggestions for how a user interface should be designed and behave	-Impose a measure of consistency	-Often written in too general terms -Difficult to enforce
Objects/Actions Interface Model	Decomposing information into a hierarchy of manageable units	-Reasonable to decompose information into basic components -Elemental information can be combined into complex forms	-Organizing the elements into a hierarchy is difficult -Must have clear definitions to be conveyed to designers
Ecological Interface Design	Represents constraints in the task environment relevant to the user	-Functional constraints can be specified in systems whose functions are bounded by known physical constraints	-For e-commerce and the Web, functional constraints are not easily defined
Information Theory	Quantifies information in bits	-Oldest method for quantifying the structure of information -Can be used to quantify the efficiency of displays	-Has not been widely used in recent years
Discourse Processing and Propositional Representation	A way to characterize the ideas represented in sentences and paragraphs	-A useful way for analyzing aspects of text structure -Describes how people comprehend, remember, and respond to questions about texts	-Propositional representations have to be constructed through hand coding -Difficult to use for large applications
Latent Semantic Analysis	Analyzes the meaning of text	-Simulates human understanding of how words form meaning -Provides a measure of text coherence	-Based on statistical properties of language use alone
Multivariate Analysis	Provides a representation of the dimensions for concepts	-Provides information about global relationships	-Difficult to apply to large datasets and to systems that change
Concept Sorting	Establish relations among a fixed set of concepts	-Determines relations among components -Helps structure information	-Grouping may not be optimal -Resulting structure may be too elaborate

Table 3.

Methods for improving Web Search and their major advantages and disadvantages.

Method	Brief Description	Major Advantages	Major Disadvantages
Natural Language Processors	Analysis of meaning based on semantic relations	-Attempts to determine user's intent	-Users' queries are usually too short
Latent Semantic Analysis	Analyze the meaning of text	-Sentences or concepts can be analyzed to find similar topics based on semantic relationships	-Users' queries are usually too short
Adaptive Search/ Agent-Based Technologies	Profile users' past behaviors to predict their goals	-Works well if trying to find similar items to previously searched items -Works well for finding related items within a session	-Not very effective if looking for a new or different item -Agents may log the "wrong data"
Meta Tag Tools	Indexes the words in a Web page	-Allows designers to control how the page is indexed -Can specify additional keywords to index page	-Labor-intensive to create helpful meta tags -Not all search engines support meta tags
Database Search Engines	Search engines process an indexed database for a Web site	-Easy to add new items to the database -Commercially available	-Can result in long response times -Can produce irrelevant search hits
Meta-search Engines	Submits keywords to multiple search engines	-Quicker and easier for users to use multiple search engines	-Returns too many hits -May return redundant hits
OminiSearch	Extracts useful data objects from dynamic Web pages	-Can extract information from dynamically changing Web pages -Extracts relevant aspects of a document	- Has scalability issues
Powerful Search Engines	Fast and accurate search engines allow users to get good results	-Get results with little effort	-Very few commercially available (e.g., Google, Vignette) -Requires significant development effort
Thesauruses, Dictionaries, and Alternate Spellings	Incorporation of thesauruses and dictionaries into search engines	-Can correct for typos -Improve likelihood of relevant matches	-Labor-intensive to add new entry -Requires ongoing maintenance
Search Categories	Provides users with predefined categories to narrow search	-Search results likely to yield desired results	-Works well only if users know exactly what they are looking for -Requires extra user steps -High maintenance