

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 |