Usability Assessment in Mobile Computing and Commerce

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USABILITY STANDARDIZATION

Usability is an acknowledged important aspect of any system or product design. Researchers have found that a good interface design promotes higher mutuality (feeling similar and connected), which, in turn, leads to higher levels of involvement and a favorable impression of credibility.

Many practitioners and researchers (Nielsen, 2000) have elaborated on usability aspects, but few have agreed upon a unifying definition. In 1998 the International Organization for Standardization (ISO) defined usability as follows:

Extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use. (ISO 9241-11, 1998, p.2)

From this definition, it can be construed that effectiveness, efficiency, and satisfaction are three pillars for usability measures. In this regard, the ISO defines:

- effectiveness as the "accuracy and completeness with which users achieve specified goals";
- efficiency as the "resources expended in relation to the accuracy and completeness with which users achieve goals"; and
- satisfaction as the "freedom from discomfort, and positive attitudes towards the use of the product."

The ISO standard acknowledges that the level of usability depends highly on the intended context of use (e.g., users, hardware, software, and social environments). Researchers have demonstrated that the three ISO usability components are distinct. Frøkjær et al. (2000) found only a weak relationship among the three usability components. Walker et al. (1998) found that efficiency did not translate into user satisfaction. These empirical studies suggest that efficiency, effectiveness, and satisfaction may be independent aspects of usability, and a causal relationship among them may be weak or even nonexistent.

OTHER DIMENSIONS OF USABILITY

Research has not been limited to the three main ISO characteristics. Researchers such as Sing (2004), Hilbert and Redmiles (2000), and McLaughlin and Skinner (2000) support ISO standard's recommendation that usability is highly contextual and built on factors such as the users' past experiences with similar systems, the role they play, and the environment in which the product is used. In addition, users' expectations and priorities toward usability also depend on the role they play and the position they hold.

Sing (2004) cites studies that include software usability components of (a) flexibility (users perceive that the system can adapt to their preferred style of interaction); (b) easy to learn (users perceive that it is easy to gain required knowledge to achieve a satisfactory level of competence); and (c)

easy to remember (it is easy for users to recall system features after a period of time).

Hilbert and Redmiles (2000) offer similar dimensions of usability: (a) learnability (the system is easy to learn); (b) efficiency (the system is efficient to use); once a user masters the system; a higher level of productivity is possible; (c) memorability (the system should be easy to remember, even for casual users); (d) errors (the system should have a low error rate); and (e) satisfaction (the system should be pleasant to use).

McLaughlin and Skinner (2000) examined six usability components on new IT implementations: (a) checkability (the system's ability to ensure information correctness); (b) confidence (the users' confidence in their ability to use the system and in the system itself); (c) control (system offers the users control); (d) ease of use; (e) speed of use; and (f) understanding.

USABILITY EVALUATION METHODS AND INSTRUMENTS

Evaluation Methods

The approach undertaken for usability varies, depending on the intended goals. Ivory and Hearst (2001) outlined a taxonomy view of usability test methods as follows:

- **Method Class:** Testing, inspection, inquiry, analytical modeling, and simulation.
- **Method Type:** Log file analysis, guideline review, surveys, GOMS analysis, genetic algorithms, and so forth.
- **Automation Type:** None, capture, analysis, critique.
- **Effort Level:** Minimal effort, model development, informal use, and formal use.

Table 1. Usability Instruments

Instrument	Application	Usability Dimension
(1) Software usability measurement inventory (SUMI) (Kirakowski & Corbett, 1993)		
SUMI is intended as an instrument to measure perceived software quality from the end-user standpoint. SUMI consists of 50 questions measuring quality of use in five usability aspects.	Software	Efficiency, effect, helpfulness, control, and learnability.
(2) Web site analysis and measurement inventory (WAMMI) (http://www.wammi.com)		
WAMMI consists of 20 questions to measure the five aspects of Web site usability. The assessment result is compared to a database of similar Web sites to generate the final overall usability rating.	Web sites	Attractiveness, controllability, efficiency, helpfulness, and learnability.
(3) Measuring the usability of multi-media systems (MUMMS) (http://www.ucc.ie/hfrg/questionnaires/mumms/index.html)		
MUMMS targets the assessment of use quality in multimedia systems. It uses the same usability dimensions as SUMI.	Multimedia systems	Efficiency, effect, helpfulness, control, and learnability.
(4) Usability task questionnaire (Sing, 2004)		
Sing's usability task questionnaire consists of 25 Likert-type questions and two open-ended questions. The goal of this questionnaire is to assess six usability components.	Electronic stores	Effectiveness, efficiency, flexibility, easy to learn, easy to remember, satisfaction
(5) WebQual (Barnes &Vidgen, 2002; Barnes, Liu & Vidgen, 2001)		
WebQual is an instrument based on quality function deployment (QFD), which is a structured process to capture "voice of the customer" through each state of product or service development. The current version of WebQual is a 23-question instrument to measure the three quality dimensions of Web sites.	WAP and Web sites	Information quality, interaction and service quality, and usability