Development of Tool for On-line Usability Testing of Information Appliances

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1. Introduction
As work of human being has become less physical and more mental, the key criteria of effective worker performance have shifted from the speed or range of motion of their limbs to the quality and flexibility of their thinking. (Adler et al. 1992) In addition, the substitute of microchips for mechanical parts, the product has become less tangible and ‘black box’, which makes the key success factor of product as ‘the usability: the capability to be used by humans easily and effectively.’ (Shackel 1991) Particularly, the concept of usability has become highly valued in the area of information appliances and software where users’ works are mainly mental. This shift has led to the wide application of ‘usability testing’ for ensuring the quality of usability before launching the product to the market. Typical methods for usability testing includes interview, guidelines, heuristics, cognitive walkthrough, prototypes, protocol analysis, cognitive modeling, observations and so on. Although most of usability testing methods are useful in their own context, the most valuable method of usability testing is to let users perform tasks and observe them for its rich contextual data and users’ direct behavior. Usually this kind of testing is done in laboratory equipped with one-way mirror and video recording facilities. However usability testing in the environment of laboratory has been known to cause some significant problems: high cost and unnatural environment. (Rubin 1994) The goal of this study is to propose the new prototype of tool for solving those problems by introducing ‘on-line usability testing for information appliances.’

2. Problems of Existing Usability Testing Methods
Existing method of usability testing in the laboratory, in spite of its advantages, has serious problems. At first, running the usability testing in the laboratory costs lots of money and takes time and effort. A number of users should be recruited and physically brought to the laboratory where the testing is done; they should participate the usability testing at least more than 2 hours. After recording of all user performance is done, the data should get through exhaustive analysis process: measuring time, picking up errors, logging the data, and so on. Secondly, problem lies in the unnatural atmosphere of laboratory where users participate the testing. The usability testing room is usually equipped with one-way mirror for uninterrupted observations and video cameras. An user is left alone to perform the tasks according to the instructions usually given through microphone. This kind of ‘prison-like environment’ can intimidate inexperienced users, which prevents them from showing natural responses and performance.

3. Development of Tool for On-Line Usability Testing
These above-mentioned problems can be solved by implementing ‘on-line remote usability testing’. Particularly, due to the increased penetration of the Internet, it is quite possible to upload tasks for usability testing on the web and let users perform tasks in their
own familiar environment. (Nielsen, 1996) Users simply visit the website from his normal working environment where usability testing program is loaded and perform tasks given to them. Then all the performance data is transmitted to evaluator's server and analyzed. The prototype of tool was developed with the objectives as follows: (Figure 1)

- Use Internet for automating usability session.
- Let users participate the testing as naturally as possible.
- Make the way of collecting user's performance data as simple as possible.
- Make the tool work with the collaboration of other related tools like ordinary statistical programs or word processor.

![Users performing tasks in their own normal working environments](image1)

![Evaluator giving usability tasks to users and collecting automated performance data](image2)

*Figure 1. The concept of on-line remote usability testing*

3.1. Module of Usability Testing

The tool has the structure comprising of two main modules: testing module and analysis module. These two module go through the process shown in Figure 2.

In the testing module, at first, the overall purpose and process of the usability testing is introduced and then user is guided to input their demographic data like gender, age, use-experience and so on. After identifying user's profile, a warming-up session is given to user for familiarizing himself or herself with on-line usability testing. The warming-up task is usually very simple like adjusting digital clock. Then, user begins to perform the tasks given by operating the computer-simulated information appliances. User uses mouse to press control buttons, for which the product responses exactly same as real product. While performing tasks user can refer user's manual for help and skip the task if he or she cannot continue the task for its difficulties. In addition, if user is equipped with microphone he or she can perform 'think aloud'. After finishing all the given tasks the debriefing session starts to ask few more questions regarding test itself or to get other feedbacks from users.

The sample screen of testing module is shown in Figure 3. As shown in Figure 3, the computer-simulated product for testing is shown on the screen with the task bar and other control buttons for skipping task and opening user's manual.

![Test Module](image3)

![Analysis Module](image4)

*Figure 2. The Structure and Process of the Tool*
3-2. Module of Analysis

As soon as the user finishes the usability testing session, all the usability data including time taken, operational path and voices recorded from ‘think aloud’ is transmitted to and saved in the evaluator’s server. These data is analyzed variously for finding problems and insights for generating solutions.

At first, all the interacting processes by users while they were engaging the usability testing are replayed with the exactly same operational paths, sequences and time. The operational traces are visualized in line over the product so that analyzer can easily see how user interacted, moved around, made errors and so forth. This replay is done with the interface like on VCR: a researcher can stop, pause, play, fast forward or rewind by clicking control buttons. In addition, user’s protocol data from think aloud is also replayed. If analyzer needs to analyze user’s interaction in detail, he can stop the play.

While the user’s interaction is replayed, at the same time, the interaction process is visualized in another way. This time, the user’s interaction is visualized in terms of interface structure. In the parallel with small window of product where user’s interaction is replayed over actual physical product, there is another small window where interface structure of product is shown. A researcher can see user’s interacting behavior in terms of the structure of interface: how deeply user went down, how frequently user changes the level of interface depth and so on. The play in the window of interface structure is synchronized with the play in the product window so that a researcher can get the view of user’s interacting behavior on product and interface structure simultaneously.

Finally, all the data is summarized in the table: pressed buttons, time taken, user’s action, sequence, user’s protocol data, a researcher’s comment. In this summarizing table, a researcher can sort out the time and easily search for specific interaction by simple click of relevant cell of table. For further analyses, researcher can conduct cross-tabulate between different elements. For example, researcher can find out what type of users made specific types of errors by cross-tabulating element of ‘user’ and ‘error’. All the data can be exported to other conventional software like statistical program or word processing software. The sample screen of analysis module is shown in Figure 4.
4. Conclusion and Further Study

The current tool is still on the development of prototyping stage. The tool shows the potential advantages in several respects: low cost of management, easy collection of testing data, short time to conduct usability testing, provision of natural atmosphere to user to test the usability, and availability of diverse ways of insightful analysis.

However, even with various advantages of on-line remote usability testing, it needs further refinements in several respects. At first, a product bigger than the size of computer monitor can cause the problem because the product is shown smaller than actual size. Secondly, types of users participating in usability testing can be limited only in those who can access the Internet and use Internet without any serious problems. For effective implementation of the tool these problems should be further improved.

Reference


