USER INTERFACES’ USABILITY AND ACCEPTABILITY

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Abstract: This paper describes a research on the relationship between usability and acceptability of user interfaces. The objective is to investigate which usability criteria are more important for positive user’s attitude and how acceptability influences the usability components (effectiveness, efficiency and satisfaction). The investigation includes measurements of user’s task performance and a study of acceptance of different design alternatives. The goal is to improve the interface design process and results. To search the balance of interface design strictly following usability rules and trying to achieve best satisfaction of user’s wishes.

Keywords: USER INTERFACE DESIGN, ERGONOMIC DESIGN, ACCEPTABILITY, USABILITY EVALUATION

1. Introduction

Functionalities and graphical user interface (GUI) are the most important factors for the success of an interactive system. Usability is not guarantee, but a precondition for acceptability of the system. User acceptance means also not necessarily usability, but is relevant for the performance [1]. This is a trial to find out the relation between user interface usability and acceptability, which are two leading criteria for the successful GUI design.

2. Prerequisites and means for solving the problem

The first goal of this research is to find out the relevant usability criteria for user’s acceptance. The objective GUI characteristics (see Fig. 1) are connected with relatively fixed rules - about usability [2, 3, 4, 5], dialogue principles [6] or rules for presentation of information [7], Gestalt principles. For example in the international norm about usability ISO/IEC 9126 usability criteria are defined as understandability (users’ effort of recognizing the logical concept and its applicability), learnability (users’ effort for learning its application) and operability (users’ effort for operation and operation control). In the basic norm about usability ISO 9241-11, which tries to summarize the criteria for software usability evaluation, there is detailed information about measurement not only of total system usability, but also of usability components effectiveness, efficiency and satisfaction.

<table>
<thead>
<tr>
<th>OBJECTIVE GUI evaluation criteria</th>
<th>SUBJECTIVE GUI evaluation criteria</th>
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<tr>
<td>GUI characteristics connected with: Usability, Dialogue principles, Presentation of information, Gestalt principles etc.</td>
<td>GUI characteristics connected with: User Perceptions, Emotions, Attitudes, User Qualification, Information level, Participation etc.</td>
</tr>
</tbody>
</table>

Weighted GUI Usability Evaluation Values

\[ U_1, U_2, \ldots, U_n \]

Success = \[ f[\text{acceptability, performance}] \]

Fig. 1: GUI Evaluation process.

The present approach, where the goal is to optimize the evaluation process, suggests not just to claim the product GUI as usable like some experts prefer [8], but to chose only the most relevant usability criteria for the interface evaluation. This is more simplified procedure in comparison to Nielsen’s principles to follow the usability standards strictly and to check every usability parameter [4]. Another simplified evaluation approach [9] suggests 16 criteria for usability of accessible web sites, where just three of them are connected with users’ satisfaction against the large number effectiveness (five) and efficiency criteria (nine).

The main objective of present investigation is to choose from the list with numerous usability criteria these, which are most important for the positive user’s attitude toward the system not forgetting efficiency and effectiveness factors. The subjective GUI evaluation criteria depend on users’ emotions, perceptions, attitudes, qualification, information level and participation (see Fig. 1). For example the individual’s perception of “ease of use” is connected not only with his/her experience and with interface objective characteristics, but also with user’s current mood and motivation. A major factor for user’s acceptance is the pleasure to work with system [1]. It means that acceptance increases positive affect, broadening the creativity and increasing the tolerance for minor difficulties. In addition to the performance-acceptance cycle [10] this is an attempt to precise the information about influences of acceptability on all usability components (effectiveness, efficiency and satisfaction). The acceptance is a predictor for satisfaction, but the relation between acceptence and effectiveness/efficiency is not so obvious. So besides the registration of performance factors (for example, execution time and errors of test participants) it is obtained information concerning users’ opinion about importance and acceptability of different GUI and system characteristics (by check-lists and questionnaires before and after the usability test with different rating scales). That way is registered users’ pleasure of system’s functioning (features) and appearance (interface). For best results – successful software systems with usable GUI – are substantial both factors: acceptability (depending on user acceptance, effort, satisfaction) and performance (related with time and errors).

3. Results and discussion

A research on the GUI of different systems for internet banking is started at the end of 2010. The investigation is planed in four phases: 1. Preparation, 2. Experiment, 3. Analysis 4. Re-design

In the first step (preparation) are determined the test participants, the experiment tasks are formulated and are chosen the evaluation criteria. In the next stage (experiment) is planed test participants to be inquired through pre-test check-lists, then they execute test tasks and finally fill in post-test questionnaires. Third phase includes experiment data analysis and summary, which are necessary for the last step - re-design, when GUI improvement proposals are given and design changes could be undertaken.

Test Participants

For test participants are fixed 20 persons - from 20 to 65 years old (7 persons in the age of 21-35 years, 7 persons in the age of 36-
50 years, 6 persons in the age of 51-65 years). They are approximately equal number men and women, more then 70% have no experience with this kind of web applications (internet banking systems), about the half have good experience with other internet applications (like web mail, on-line shopping).

Test Tasks

They perform typical tasks with the system as checking account balance, doing different payments, generating reports about payment and incomes, changing personal access data etc. The experiment includes 4 tasks with gradually increasing complexity. Each task has between 3 and 5 subtasks. For example the task “paying bills” has subtasks: 1. “Please, try to pay the bill for electricity!” (initial steps - choice of customer number and company-supplier - are done by testing person in advance, before test start), 2. “Please, try to pay the bill for central heating!” (inclusive initial steps: choice of customer number and company-supplier, only one option for supplier and amount), 3. “Please, try to pay the bill for your handy!” (inclusive initial steps: choice of customer number and company-supplier – more than one options for supplier and payment option) 4. “Please, try to pay the bills for handy, central heating and electricity!” (there is not enough available cash for 3 bills – the test person has to notice this and to decide, which payments to do).

Experiment Description

The tested objects are 3 different internet banking systems. Experiment is carried out using pre-test check lists and post-test questionnaires and automated registration of user interactions through video screen capture. The test participants first give information about experience, personal opinion about acceptability of a variety of system and GUI characteristics in principle. Then they test one of the systems performing typical tasks. The performed typical test tasks are video captured. After that users are asked to answer questions about system and GUI of the tested system. The tests of the second / third system are made after one / two week/s. Finally users fill in questionnaires about acceptability of the 3 different interface alternatives; rating questions about usability objectives are included.

<table>
<thead>
<tr>
<th>Usability objective</th>
<th>Effectiveness measures</th>
<th>Efficiency measures</th>
<th>Satisfaction measures</th>
<th>Acceptability measures</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Percentage of tasks completed successfully on first attempt</td>
<td>Time spent on first attempt</td>
<td>Rate of voluntary reuse</td>
<td>Rating scale for acceptability regarding this usability criterion</td>
</tr>
<tr>
<td>Flexibility for trained users</td>
<td>Percentage of tasks completed successfully</td>
<td>Relative efficiency compared with an expert user</td>
<td>Rating scale for satisfaction with system features</td>
<td></td>
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<tr>
<td>Learnability</td>
<td>Number of functions learned</td>
<td>Time to learn</td>
<td>Rating scale for ease of learning</td>
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<tr>
<td>Minimization of support requirements</td>
<td>Number of accesses to HELP</td>
<td>Productive time</td>
<td>Rating scale for satisfaction with support facilities</td>
<td></td>
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<tr>
<td>Error tolerance</td>
<td>Number of user errors tolerated</td>
<td>Time spent on correcting errors</td>
<td>Rating scale for error handling</td>
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</table>

1 Rating scale: from 1 – “not satisfied at all” to 5 – “very satisfied”
2 Rating scale: from 1 – “very difficult” to 5 – “very easy”
3 Rating scale: from 1 – “very bad” to 5 – “excellent”
4 Rating scale: from 1 – “not important” to 5 – “very important”

Experimental results

The started experiment is brought to the end for 9 test participants: 2 persons in the age range of 51-65 years, 4 persons in the age range of 36-50 years and 3 persons in the age range of 21-35 years. The initial results confirm the opinion that the interface usability assessment should pay special attention on users’ acceptance for more efficient GUI evaluation process. The goal of the research is also to provide recommendations about the optimization of interface evaluation process studying factors, which influence users’ attitude. So the usability measurements accomplished during the usability test are based on the ISO 9241-11: effectiveness, efficiency and satisfaction measures and supplemented by acceptability measures (Table 1). Some usability criteria determined as relevant for user acceptance and performance are: ease of use (number of system functions learned easily, tasks performed successfully on first attempt or after short training, etc.), error tolerance and support usage (tolerated errors, productive time, time spent on correcting errors and using help-system), presentation of information (logical information hierarchy, intuitive graphic elements, etc.). After the experiment is completely finished data from the automated test records (user performance) and the checklists and questionnaires (GUI acceptability) will be summarized and re-design proposals will be given on basis of this summary.

4. Conclusion

The presented research is an attempt to optimize the usability assessment by choosing relevant criteria for the acceptability of the GUI qualities to use them for a successful evaluation process. This is also the way to improve users’ performance. Both factors - interface usability and acceptability, are substantial for internet systems success and an investigation on the relation between them is worth. Definitely usability has influence on acceptability and the opposite, but more detailed information about this relation would be very useful for GUI designers and evaluators.

5. References