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DESIGNING USABILITY EVALUATION METHODOLOGY IN THE CASE OF OPENSCOUT PORTAL

MATIJA PIPAN
Jozef Stefan Institute, matic@e5.ijs.si

Abstract: *Today we have a range of complex (web) applications, where user interface developers are insufficiently aware of the criteria of usability as a key qualitative factor of the system, which measures the consistency of the product with the needs, goals and requirements of end users. Therefore many users have difficulties when interacting with a system which adversely affects on their effectiveness, efficiency and satisfaction and have possible negative influence on decision to its future adoption (i.e., user acceptance). This paper introduces a methodology of usability evaluation of the OpenScout portal (http://learn.openscout.net) where a combination of usability evaluation methods (UEMs) (i.e. Heuristic Evaluation, Eye-tracking etc.) is deployed to address the particularities of the portal and specific research goals: identification of usability problems (UPs) as well as user experience (UX) profiles from which HCI experts can prepare redesign proposals for the prototype improvement.*

Keywords: *Usability Evaluation, Eye-tracking, Web services, Open Educational eContents*

1. INTRODUCTION

Considering the abundance of various educational portals that have been offered over the Internet during the past decade, it is not surprising that there has been growing interest in identifying design principles and features that can enhance interactions with such systems which consequently influence user satisfaction. Indeed, user satisfaction with technologies related to distance and collaborative learning applications is an integral part of usability, which is traditionally defined in terms of effectiveness, efficiency, and satisfaction that a system gives to its user in a given context of use and task (ISO 9241-110) [4]. The usability of an educational portal is related to its level of use and evaluation of its usability is part of the processes of establishing its quality. In the literature, there are numerous recommendations for the design of pages, text, graphics, and navigation in web portals. In spite of that, it is still recognized that "severe usability problems are present and common" [1].

Usability evaluation of web based environments is traditionally conducted by means of task performance measures and subjective measures such as questionnaires, interviews, etc., but sometimes these traditional usability testing methods do not provide evaluators with all the information needed for an in-depth usability research analysis of the system. The evaluation of the user's thought process is difficult to access with classical usability techniques. Eye movement data and eye fixations can supplement the data obtained through usability testing by providing more specific information on the user's visual attention. Research has shown that the user's eyes do not wander randomly and that people look at what they are working on [3], therefore incorporating an eye tracking technique into the usability evaluation can provide some additional information. This paper further discusses the preparation of usability evaluation plan (requirements and goals) that employed a methodology combining traditional usability methods and eye tracking technique.

2. BACKGROUND

In the framework of the OpenScout project (www.openscout.net), which is co-funded by the European Commission within the eContentplus Programme as a Targeted Project in the area of Educational aims at accelerating the use, improvement and distribution of open content in the field of management education and training with a focus on SMEs and continuous training by providing skill-based search of content to large communities for learning – either in professional user communities (via integration with LMS systems) as well as to open web 2.0 communities (via integration to social network platforms). The developed OpenScout portal covers the whole value-chain of user-generated and community-improved content: from skill-based search/retrieval to support of users to improve existing and generate new contents. OpenScout is focused on two main goals:

1. To provide federated, Skill- and Competency-based search and retrieval web services within LCMS systems and social network platforms to end users: The envisaged e-content services will increase the use of open content within LCMS systems as well as open the access directly within web 2.0 social network platforms. The searched and retrieved content will originate from a large pool of different content repositories, will be of various types, and will be used in a number of ways, either as part of formal learning scenarios or as informal learning content offered directly to end users.

2. To support user-improved content: Integration of a number of novel content management and use models, with a high potential for cross-cultural/national transferability, and build an open community of providers. In this community, users are enabled and supported to localize, adapt and improve existing materials and re-publish them. This will lead to an exponentially increasing amount of contents and to new solutions for many domains [7].

Image 1: OpenScout flow

Like most technology-enhanced learning (TEL) systems, users of the OpenScout portal (http://learn.openscout.net) have to authenticate themselves by logging in with user name and password (Image 1). After entering the portal they can update their profile, including personal attributes, photo, etc. Students, professionals in SMEs or large enterprises as well as teachers or course designers can search for open management content amongst multiple repositories that fits their specific needs. The OpenScout portal provides users with an interface to start a keyword based search, filter search results, include competence search criteria, or add social metadata like tags, comments or ratings. Additionally, users are presented with recommended free tools for content adoption, collaboration and communication, they can search and follow friends who share same interests and view their content recommendations, etc.

Image 2: OpenScout portal

3. THE EVALUATION METHODOLOGY

It is imperative to validate the design of the portal that can support users to achieve their tasks with effectiveness, efficiency and satisfaction (i.e. the three usability metrics; ISO 9241-110) (ISO 9241-110, 2006). Hence, informal Heuristic Evaluation (HE) and user-based usability tests (UT), two common usability evaluation methods (UEMs) will be employed to evaluate the system. HE, based on Jacob Nielsen's ten usability heuristics, will be applied by a usability specialist to predict where UPs most likely occurred [6]. This evaluative activity aims to identify relatively severe usability and user experience problems of the prototype. Problems and suggested solutions will be reported to the design and development team, thereby removing the problems from the prototype before having it tested by end-users. Laboratory based user tests will be conducted to identify remaining usability problems and prepare improvement suggestions for redesign (i.e. recommendations). In addition to conventional performance measures (e.g. task completion rate, time-on-task), psycho-physiological measures with the use of sophisticated eye-tracking technique will be employed as well. Data gathered with the eye tracking technique such as eye movements (saccades) and eye-fixations, which somewhat reflect patterns of a user's searching and navigating the interface, can provide insight into a user's visual attention and perhaps into a user's decision making process, albeit with reservations, given human interpretations of the data. Nonetheless, data about user visual attention provided by the eye-tracking technique can supplement evaluation outcomes from traditional usability testing [8]. This not only addresses the goal of validating the system but also the research interest of investigating the relationship between objective and subjective usability measures.

User-based usability tests (UT)

In general, there are two types of usability evaluation: formative and summative. The former is diagnostic with the goal of identifying usability problems (UPs) and, possibly, solutions to resolve them, whereas the latter is benchmarking with the goal of gathering baseline measures that are used to compare with the performance of the next iterative version or competitive products/services. In the current context, we have addressed both aspects.

- **Participants**

OpenScout aims to establish an active user community of open management content with a focus on both providers and learners. The focus user groups which will be targeted using differentiated approaches are as follows: Educational institutions, Instructors and trainers, Students/learners and other participants, Librarians, SMEs and Companies. To ensure the representativeness of the evaluation test participants (min. 15) needs to be selected from the above mentioned groups. Their participation is voluntary and anonymous; they will be designated as P1, P2 and so on. Prior to working out the task scenarios with

the portal, the participants are required to complete a Pre-test Questionnaire on demographic data (gender, age, job title, interests). This questionnaire also reflects the average level of competence in ICT, the average level of competence in e-Learning, including different types of online courses, online collaboration and communication, web-based tools, etc. None of the participants should have interacted with the portal before they take part in the usability tests. These demographic data are relevant for interpreting the results of usability tests.

- **Apparatus**

The Tobii T60 eye tracker (http://www.tobii.se) paired with a 15" LCD monitor (96 dpi) set at a resolution of 1280 x 1024 is used for this usability evaluation (Image 3). This eye tracker was developed for absolutely contact-free measurement of eye movements including automatic head-movement compensation [10]. The human eye moves by alternating between saccades and fixations. A saccade is the quick movement of the eye in order to move focus from one area to the next. A fixation is the time spent looking at the newly found area. An eye tracker follows the eye during its saccades and tracks the location of the fixation points. Gaze data are logged by Tobii Studio v.1.5.6 (eye-tracking recording and analysis software). Before starting the tasks, a 9 point calibration of the eye tracker for each participant using Tobii Studio needs to be performed. All web pages are shown in Internet Explorer 9; the browser window is sized to 1280x995 pixels. The use of additional windows is prohibited. In addition, a laptop (OS Win 7, 15.4" Display monitor) is in juxtaposition with the eye tracker. It is connected to the website displaying the scale of SMEQ [9].

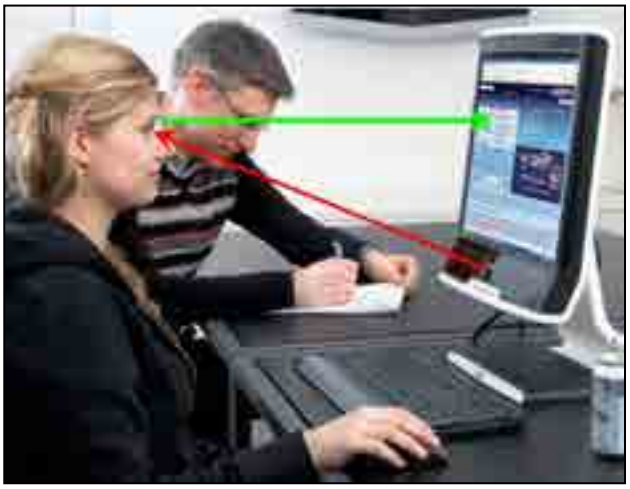

Image 3: Test person in an eye tracking situation (Tobii, 2009)

- **Task Scenarios**

A set of eight tasks covering the core functionalities of the OpenScout portal and also presenting the potential usability problems. Here below is the list of the tasks:

(T1) – Explore "OpenScout portal" and carry out a registration
(T2) – Modify personal settings and set profile
(T3) – Find and access a free content on 'Accounting in SMEs'
(T4) – Adopt the content with most recommended tool
(T5) – Publish adopted education material and make recommendations/tags
(T6) – Join a community group with similar interests
(T7) – Book a videoconferencing meeting
(T8) – Contact OpenScout team

Each of the above eight tasks were translated into task scenarios, which render the test more realistic and problem oriented (e.g. T2 Scenario: *You want to make yourself better known to the other users of OpenScout portal by posting your photo and/or writing a short autobiographical description. Here it is the pictorial file (*** pathname to access the file ***) you can upload and the sample line you can enter: "I am John Smith, a marketing counselor.").*

- **Testing procedure**

First, test participants are welcome and briefly outlined about the goal and procedure of the usability tests, which followed by an explanation of the equipment to be used. Participants are asked to perform a set of selected task scenarios that cover most frequent as well as critical functionalities of the portal. After the training tasks, the participants are given time to make themselves comfortable in front of the PC before the eye tracking calibration commenced. A 9-point calibration with corner correction is used only at the beginning. The participants are also asked to keep their head as still as possible during the experiment as to minimize inaccuracy caused by head movements (Image 3).

After each task, participants are asked to complete the After-task questionnaire, consisting of four questions (Q1-Q4), which are derived from the literature on usability research [5, 9]. Specifically, Q.1 and Q.2 evaluate the extent to which the participants are satisfied with the ease and amount of time required to complete the task, respectively. A 7-point Likert scale is employed with left anchor indicating lowest level of satisfaction and right anchor the highest. Q.3 and Q.4 evaluate the same two variables, which are nonetheless phrased differently (i.e. how hard and how time-consuming) and gauged with an online tool designed to measure subjective mental effort (http://www.usablesurveys.com/index.php) (Usable Surveys, 2009). After completing all the eight tasks, participants are asked to complete Post-test questionnaire entitled "System Usability Scale (SUS)" [2], which consists of 10 questions and has psychometric properties.

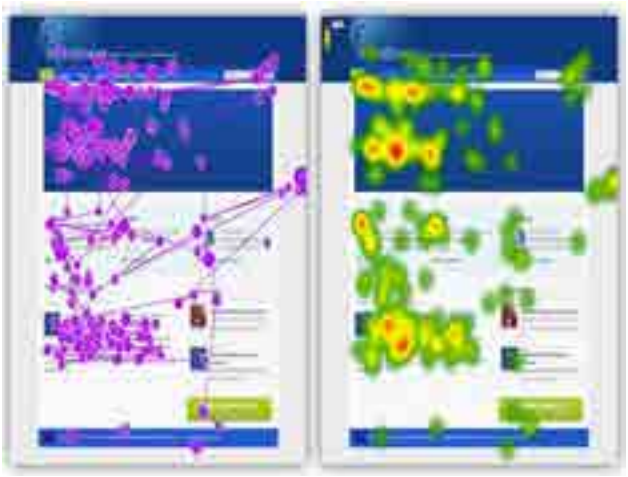

Image 3: Gaze plot & Hot spot visualization

Analysis and Results

All collected data will be structured as follows:

- Pre-test questionnaire
- Eye-tracking data
- After-task questionnaires
- Post-test questionnaire

The collected data will be categorized along two dimensions: (i) Qualitative vs. Quantitative and (ii) Objective vs. Subjective (Table 1).

	Qualitative	Quantitative
Objective	A list of usability problems (UPs) derived from the eye-tracking records of the participants' [illegible] activities when working out the given tasks	Automatic logged data of the eye-tracker: Fixation count, Fixation duration, Time to first fixation, and other statistical values
Subjective	Participants' comments to SUS (limited)	Responses to the questionnaires - Pre-test Demographic - After-task - Post-test (SUS)

Table 1: Two dimensions of data types

Usability problems (UPs) reporting structure

UPs identified in each of the eight tasks will be reported based on the following structure:

- ID - *Unique identifier of a UP with the designation UP (task number, serial number)*
- Context – *Where on the UI the UP is located*
- Description – *What the UP is about*
- Frequency – *Who committed the UP*
- Severity – *How serious the UP is*
- Recommendation – *How to resolve the UP identified*

Note that the variable Severity is categorized into three levels, namely:

- Severe: *prevent the user from completing a task or result in catastrophic loss of data or time.*
- Moderate: *significantly hinder task completion but for which the user can find a work-around.*
- Minor: *are irritating to the user but do not significantly hinder task completion.*

2. SUMMARY

In summary, we aim to identify most of usability problems and collect multi-method data, qualitative and quantitative, objective and subjective, thereby enabling us to derive solid conclusions and implications for future work. The final result of the usability evaluation will be Usability and User Experience Evaluation Report, where

- Raw data on usability and user experience will meticulously be analyzed and reported to the design and development team;

- Redesign proposals for improving the system will be discussed with the design and development team to identify their feasibility as well as priority.

Consequently, the usability of the system will be improved, and the evaluation methods being deployed will be reviewed and enhanced.

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