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Methods and Tools to Analyse the Web-based User Interface Usability, and the Appearance of the Topic in Education

Introduction

Usability in literature and in some standards is defined differently. „The 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. (1992/2001)]. „A set of attributes that bear on the effort needed for use, and on the individual assessment of such use, by a stated or implied set of users" [ISO/IEC 9126 2001]. „The capability of the software product to be understood, learned, used and attractive to the user, when used under specified conditions" [ISO/IEC FDIS 9126-1 2000] In ISO standards two options of usability appears, on the one hand, as a software planning practice, on the other hand, as a complete aim – a software to satisfy the users' desire [Bevan 1999].

In the next definition – in contrast to what is above – the usability is approached form the users' interfaces. According to J. Nielsen: „Usability is a quality attribute that assesses how easy user interfaces are to use" [Nielsen 2003]. „Usability is not a single, one-dimensional property of a user interface. Usability has multiple components and is traditionally associated with these five attributes: Learnability, Efficiency, Memorability, Errors, Satisfaction" [Nielsen 1993]. But what is hidden in these usability parameters (factors):

1. *Learnability*: The system should be easy to learn so that the user can rapidly start getting some work done with the system.
2. *Efficiency*: The system should be efficient to use, so that once the user has learned the system, a high level of productivity is possible.
3. *Memorability*: The system should be easy to remember, so that the casual user is able to return to the system after some period of not having used it, without having to learn everything all over again.
4. *Errors*: The system should have a low error rate, so that users make few errors during the use of the system, and so that if they do make errors they can easily recover from them. Further, catastrophic errors must not occur.
5. *Satisfaction*: The system should be pleasant to use, so that users are subjectively satisfied when using it; they like it.

Researchers use not only these factors while analysing usability. Jabbar et al. introduce many factors that are different from Nielsen's point of view but as there

are references on five factors in literature and different standardization bodies and researchers also referred to these usability parameters, the authors also used these factors represented by Nielsen for their research [Jabbar *et al.* 2007].

No matter which one of these models we use, we should take the correlation between the usability factors into account. For example, if we would like to reduce the faults made by the users in the applications, we should apply methods (wizard that helps the user to achieve his goal step by step) which can make the resolution time more but reduce the effectiveness [Bodrogi 2001].

Of course beside usability there are other quality characteristics that influence how much the product can satisfy the expectations. One of these characteristics is utility. If a function is not useful for the user, then a usable, intuitive interface will not be either, so the simple usability is not a guarantee for user satisfaction.

To have a really useful application for users, the main focus must not be on graphics and outlook while planning. First of all, we should be aware of the customer's demand – what functions should be available on the interface. It is advised to have a plan drawn to sign the appropriate places (regarding the stress) of the functions. It can be done with the help of a pencil and a piece of paper but software for „wire frame" or „mock-up" is also a possibility, such as Balsamiq Mockups[2], Mockup Screens[3], ForeUI[4].

The wireframe plans show how the elements, their order and their place are positioned on the interface. It is revealed from the wire frame plans if the interface is too complex or impenetrable, so it is possible to modify before making the design plans.

Interfaces planned this way should also be tested by users. While using the method of paper prototype, the operation on the interface is simulated and performs real exercises with the help of a representative group of users. Of course, the person who runs this prototype (or in the case of an application with sufficient knowledge, the software itself) has to provide the changes on the interface, so pending on the activities, the user can change the whole drawn/sketchy interface or a part of it.

The Methods of Usability Analysis

In literature, there can be found more methods regarding usability analyses. Peterson & Olney states that they can be divided into three main categories of usability analysis [Peterson, Olney 2009]:

1. To accomplish a *usability test*, defining research goals, representative participation of target group users and a collection of quality and quantity data

[2] http://balsamiq.com/download.
[3] http://www.mockupscreens.com/.
[4] http://www.foreui.com/.

about the analysed product's performance and the preferences of the participants are needed. The think-aloud protocol is a good method while collecting data. This means that during the study, participants tell aloud what they intend to do on the interface, what their aim is, and they also comment their reactions (such as success or failure).

The test takes place where the development is, in a laboratory, and every participant have to do the same task, sticking to the same script. It is important to provide participants the same treatment and to reduce interaction between researcher and subject as much as possible.

2. *Usability inspections* contain heuristic evaluations and walkthrough methods. Heuristic evaluations are made by groups of 3–5 people, who work independently and analyse the system based on given criteria. Participants usually fill a form and/or solve typical user tasks based on a description. During a heuristic evaluation often Likert scale is used, that can be summed and analysed by descriptive statistical methods.

   During the *access* the evaluating experts go through possible user actions to solve the task. While doing this, they note down what kind of usability problems they have found. The detailed description of a future system's prototype, the description of the professional tasks, the list of actions within the prototype needed to fulfill the tasks, the description of users and their state of experience and knowledge are essential to the access [Bodrogi 2001].
3. *Usability inquiries* provide quality results. Its method is the usage of focus groups, preparation of interviews. These studies appear in the early state of product development. It is possible that at that time the prototype is not even available. The aim is to collect ideas and the recognition of users' expectations.

Usability inspections in practise

At Faculty of Informatics of Eötvös Loránd University, students meet the basics of web page construction, the standards of (X)HTML, HTML 5, the opportunities given by Cascading Style Sheets during course Web-development 1. We provide attendants a detailed curriculum with many interactive examples that can be found at http://webfejlesztes.inf.elte.hu.

While on trainings our aim is to introduce different standards and their use (CSS3, XHTML,HTML5), on lectures information on ergonomics, usability, accessibility (WCAG 2.0) are mentioned, based on the following main topics:

1. *Ergonomics of web page construction, examples, ideas, methods and tools*: Notion of web ergonomics, methods and tools of web-based interface usability analysis, user experience, content planning, page planning, typical mistakes in web page construction, usability of multimedia elements, platform independence, navigation possibilities, ergonomics of forms, internationality.
2. *Accessibility and Universal Design*: Introduce problems of handicapped user groups, idea of Universal Design, construction of WCAG 2.0 standard, basic

notions, directives and guidelines of accomplishment, examples, and checking tools.

During semester attendants have to solve two tasks to get a grade.

1. *Creating an own website on a chosen topic*. As the former task lacks individual creativity, students should hand in an individually planned and created website. There are some quantity (at least four pages long, containing pictures, background picture, form, charts, etc.) and quality (it has to be valid in given document type, it has to be in balance with ergonomic and accessibility ideas mentioned on lectures) criteria that have to be complied. The developed website is evaluated by the tutor, who calls attention to mistakes, shortcomings, and development possibilities. As sites are also evaluated upon usability/ergonomic criteria, students get good grade if they know methodology of website creation too, not only the technique.
2. *Participation in usability test/analysis*. I introduced this task in the second semester of year 2010/2011. I wanted usability and ergonomics to have more emphasis in this subject. In this semester, students had to make a guideline-based analysis observing different, randomly chosen Hungarian webshops.

Analysing Webshops in Practice

As we are training mainly software engineers, I think it is important for them to know ergonomics of company websites/webshops. A. Rung – a Hungarian researcher of ergonomics – made a downloadable free e-book of webshop designing accessible on his blog [Rung 2011]. It summarises the main designing ideas. To compare webshops in their usability, according to description, a measuring tool should be made to analyse how much webshops meet the requirements of different designing ideas.

I defined conditions according to different categories when making the tool. Categories are the following: Opening page, Menu bar/Categories, Search, Product page, Product comparison, Basket/Cart, Finish shopping.

Based on these categories 77 conditions are defined. I would like to highlight one from each category:

1. At opening page, products are available in more categories (e.g. special offers, most mostly searched products, recently purchased products).
2. Information on delivery costs is easily available.
3. If someone started a simple search with appropriate keywords, he/she can narrow results with Advanced search.
4. Products are illustrated with high-quality, large photos.
5. There is an opportunity to compare products.
6. It can be seen always how many products are in basket and how much they cost.
7. If purchase happens in more steps, on the top it is signed at which step user is at and which steps come next.

To sum results easily up, students got an Excel table where they could sign if a guideline was fulfilled and they could note their comments too. If the student fills the form in, he/she can check statistics in the form below:

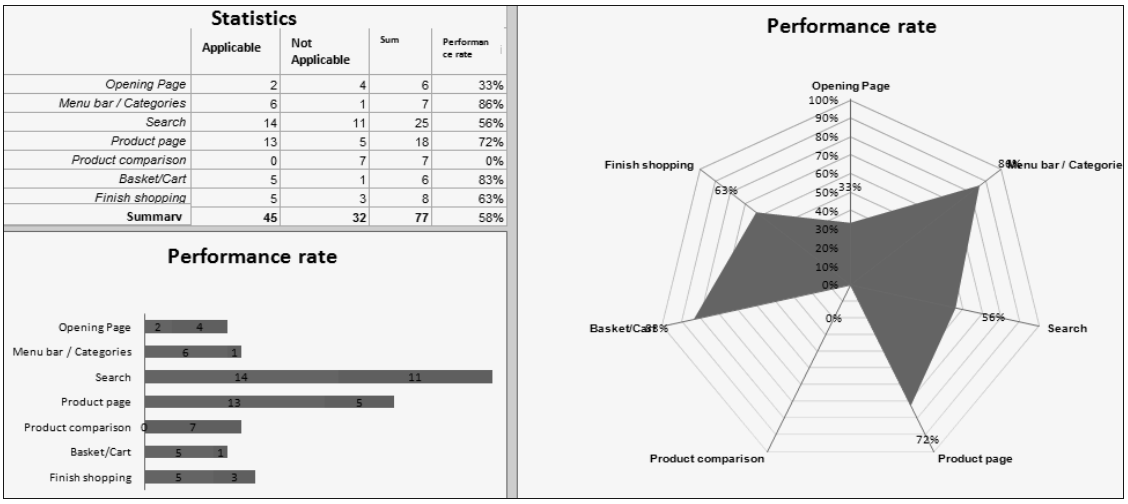

Fig. 1. Statistics about performance rate

Students were analysing more that 130 Hungarian webshops after directives. The best webshop fulfilled 82% of guidelines; the worst one achieved 29%. In average, most of the shortcomings are in categories of search and product comparison in the case of analysed webshops. In the later category 84% of websites could not get a point out of 6. Regarding overall performance it can be said that if we observe usability, most of the webshops are average.

Conclusion

After summing up the results, I could tell which web shops are the most adequate in terms of usability, so I could present them as good examples to my students on my lectures. As I did not only introduced them on a plenary lecture, but students should have made an analysis, theories stuck in their head more effectively and it also motivated them, they are always asking about results and waiting for the outcome.

Literature

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Abstract

In literature, there can be found many methods and descriptions regarding the ways of a useful usability analysis. In my article, I would like to summarize the most recent methods and tools of the analysis of web-based user interface usability, and show a case study, where our students involved in heuristic evaluation of 130 Hungarian webshops.

Keywords: usability, methods of usability analysis, analysing webshops in practice.