

Guided-Based Usability Evaluation On Mobile Websites

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Abstract— We live in a mobile world and usability is an important issue for mobile. Considering two mobile websites, how can you tell one of them is more usable and user friendly than the other one? This paper shows how to make a usability evaluation on mobile websites. It covers many guidelines and researches offered to designers to make user friendly interfaces. In this study, we introduce a usability evaluation tool that provides an environment for usability experts and describe how we use it in our Guided-Based Usability Evaluation Model (GBUEM). This study is aimed to contribute to mobile usability area, which is an important and hot topic.

Keywords-usability; mobile; evaluation; usability guidelines

I. INTRODUCTION

In today's world, the use of mobile website is increasing day by day and internet access from mobile devices is gaining importance. A substantial part of Web users connect internet from mobile devices. Each year there is a huge growth in the mobile share of web traffic across the world. In the fourth quarter of 2012, 23.14 % of total website traffic was generated via mobile devices, while the same number was a mere 12.59% in 2011 [1]. Mobile devices have advantages compared to desktop computers from the point of accessibility and portability.

Most of the operations that can be done with regular websites can also be done via mobile websites, which are specifically designed for mobile devices. Success rate of mobile website usability is 64%, while the same number is 58% for regular websites, which are designed for full-screen desktop computers [2]. It leads us to the fact that website designers should also focus on building mobile websites besides regular websites.

One of the most important problems of mobile Web is the usability problem. The mobile Web provides very different set of challenges, such as limited bandwidth, limited input capabilities, small screen size, and no flash script capabilities [3]. Because of this, there can be many usability problems for the end users. Users can revisit the websites if they are satisfied in performing their tasks. To this end, increasing mobile usability standards is important for helping

users to enhance their web surfing experience in mobile websites. Usability problems need to be investigated and solved in order to make end user more satisfied. In this context, we argue that evaluation of the usability of mobile websites has significance.

This paper includes following sections. Section II presents the definition of mobile usability and background of our study. Section III presents the Guided-Based Usability Evaluation on Mobile Websites. Section IV presents the practice of proposal methodology. Finally, section V presents the future work and conclusion of our study.

II. BACKGROUND FOR MOBILE USABILITY

A. Usability Definition

There are several usability definitions. ISO 9241-11 gives the conventional usability definition. It defines usability as "the extent to which a product can be used with effectiveness (number/percentage of completed tasks within allotted time, number of errors), efficiency (time to complete a task) and satisfaction (subjective user attitude) in a specified context of use" [4].

On the other hand, usability is defined by five quality components by Nielsen Norman Group, which is the leading research group in usability [5].

- Learnability: how easy users perform their basic tasks in the first place?
- Efficiency: how quickly can users perform a task?
- Memorability: how easy is to reuse the system after a break?
- Errors: How many errors do users make and how serious are these errors using the interface?
- Satisfaction: How do users like the interface?

B. Mobile Usability Background

Usability is a key concept in mobile world because in mobile world tasks are time sensitive. Mobile websites should provide user satisfaction. If a website is not user friendly, users may leave the website page immediately. On average, the user spends less than a minute on a web page [6]. This is a very little time for websites. In order to increase

this number, websites should be designed based on user perspective.

Mobile devices, which are designed for a specific function, can perform additional tasks with some limited processing capabilities, wireless network connection and memory [7]. Mobile devices have more limitations compared to desktop computers. These limitations can cause many usability problems. Mobile web usability success rate of today is almost the same as the desktop usability success rate of 1999. Current desktop usability success rate is 84%, and unless its mobile counterpart starts improving rapidly, it will not reach that level until 2026 [2]. This demonstrates that there is room for research and development in mobile usability.

It is about twice as hard to understand complicated content when reading in touch screen based mobile phones compared to desktop computers. In this study, the only parameter that is accounted for is the screen size, which is the reason for lower comprehension score in mobile devices [8]. According to this research, it can be concluded that a separate mobile version of website should be designed to have a better understanding of the content for the user. The website should automatically detect the mobile device of the user, and divert it to the mobile website [9].

Traditional usability methods that are employed for desktop computer environments, are not directly applicable for mobile environments due to certain mobile specifications. New approaches and methodologies should be considered in the context of mobile. Mobile devices and mobile technologies change rapidly therefore usability evaluation methods and guidelines should be revised.

There are other studies on mobile web environment, which investigates the environmental effects on mobile web usability, mobile web usability documentation, remote usability testing, lab and environmental mobile usability testing. Nielsen Norman Group has also two reports on mobile web usability [9-12]. Contribution of our study is defining a practical way and presenting an environment for experts to evaluate a mobile website according to researches and guidelines.

III. GUIDED-BASED USABILITY EVALUATION

In this study, we show how GBUEM can be applied on mobile websites in a practical way. In this context, guidelines, which make recommendation for mobile websites in terms of usability, are analyzed. In the analysis process, these guidelines are categorized and list of rule is defined. Fig. 1 demonstrates the flow chart for how GBUEM is performed.

A. Usability Standards and Guidelines

ISO-9241-151 Guidance on World Wide Web User Interfaces provides guidance on the human-centred software design for Web user interfaces with the aim of increasing usability.

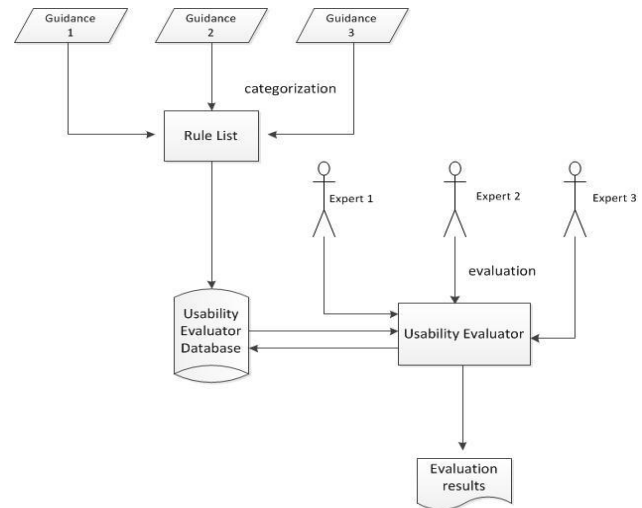


Figure 1. Guided-Based Usability Evaluation Model

This standard contains recommendations specific to Web interfaces. “Research-Based Web Design & Usability Guideline” (RBWDUG) is also not compatible with mobile Web interface. But these guidelines have some recommendations, which can be applied on mobile websites. First part of our study is to investigate and expose these recommendations. It is clear that the design of mobile Web interfaces or smart devices could require additional guidance [13].

Second part of our study is to do a literature search on guidelines, which are tailored towards mobile websites. Nielsen Norman Group’s Mobile Usability Guidelines make suggestions for Mobile Web Interfaces. “Usability Of Mobile Websites” (UMW) guidance is based on methodical observations, interviews, user diaries, as well as in-house expert reviews [14]. Their first mobile usability report is announced in 2011 and includes 85 design guidelines for Improving Access to Web-Based Content and Services Through Mobile Devices. In the following year, there have been huge technological improvements in mobile therefore requirements for mobile devices have changed. In 2012, second edition of mobile usability is announced and the number of design guidelines increased to 210 [2].

The World Wide Web Consortium (W3C) announced “Mobile Web Best Practices 1.0” guidance. This guidance outlines 60 guidelines in ten groups for designers and developers to design and deliver content that works well on mobile devices. Its main objective is to improve the user experience of the Web when accessed from mobile devices [15].

Apple’s IOS Human Interface Guidelines and Android Human Interface Guidelines are style guidelines for designers who make user interfaces for applications. They tell designers how to design user friendly applications depending on operating systems. These guidelines are not

independent from the platforms. Main objective of these guidelines is to provide consistent design on dependent operating system. They commonly do not make recommendations for mobile websites, which run on different kind of operating systems [16, 17].

B. Guided-Based Usability Evaluation Method

Literature search on guidelines is followed by the categorization step. In the categorization step, guidelines are grouped according to their focuses. List of rule is created in the following categories: accessing, content, homepage, typing, links, searching, navigation, forms, menus, logging, errors, listing and scrolling, images-videos, information.

TABLE I. DEFINITION OF SEARCHING RULE LIST (SEARCH FUNCTION)

| RULE | SOURCE | GUIDELINE | GROUP |
|----------|---------------------------------|--|-----------------|
| Rule 1.1 | ISO 9241-151 8.5.2.1 | Providing a search function | Search Function |
| | ISO 9241-151 8.5.2.2 | Providing appropriate search functions. | |
| | UMW First Edition Guideline 45. | For smartphones and touch phones with relatively large screens, include a search box on your mobile website | |
| Rule 1.2 | ISO 9241-151 8.5.2.3 | Providing a simple search function. | Search Function |
| | RBWDUG 17.6 | Structure the search engine to accommodate users who enter a small number of words. | |
| Rule 1.3 | ISO 9241-151 8.5.2.4 | Advanced search | Search Function |
| | RBWDUG 17.2 | Design search engines to search the entire site, or clearly communicate which part of the site will be searched. | |
| Rule 1.4 | ISO 9241-151 8.5.2.8 | Search field size | Search Function |
| | UMW First Edition Guideline 49. | The length of the search box should be at least the size of the average search string. We recommend going for the largest possible size that will fit on the screen (30 characters). | |
| Rule 1.5 | ISO 9241-151 8.5.2.10 | Error-tolerant search | Search Function |
| | UMW First Edition Guideline 50 | Preserve search strings between searches. Use auto completion and suggestions | |
| | RBWDUG 17.3 | Treat user-entered upper and lowercase letters as equivalent when entered as search terms. | |
| Rule 1.6 | RBWDUG 17.5 | Construct a Web site's search engine to respond to users' terminology. | Search Function |
| | UMW First Edition Guideline 51. | Do not use several search boxes with different functionalities on the same page | |

In this categorization, guidelines are examined according to mobile limitations, mobile applicability and necessity to be placed on mobile user interface.

There is an example of categorization of guidelines for searching on mobile websites as shown in Table I, Table II, Table III.

TABLE II. DEFINITION OF SEARCHING RULE LIST (SEARCH RESULTS)

| RULES | SOURCE | GUIDELINE | GROUP |
|----------|----------------------|--|----------------|
| Rule 2.1 | ISO 9241-151 8.5.3.1 | Ordering of search results | Search Results |
| | RBWDUG 17.1 | Ensure that the results of user searches provide the precise information being sought, and in a format that matches users' expectations. | |
| Rule 2.2 | ISO 9241-151 8.5.3.2 | Relevance-based ranking of search results | Search Results |
| Rule 2.3 | ISO 9241-151 8.5.3.4 | Sorting or filtering search results | Search Results |

TABLE III. DEFINITION OF SEARCHING RULE LIST (REPEATING AND REFINING SEARCHES)

| RULES | SOURCE | GUIDELINE | GROUP |
|----------|--------------------------------|--|---------------------------------|
| Rule 3.1 | ISO 9241-151 8.5.5.1 | Giving advice for unsuccessful searches | Repeating And Refining Searches |
| | UMW First Edition Guideline 52 | If the search returns zero results, offer some alternative searches or a link to the search results on the full page | |

All searching guidelines, which are applicable on mobile websites, are investigated and a list of searching rules is defined. The searching list is broken down into following 3 rule groups as follows: Search function, search results and repeating and refining searches.

C. Usability Evaluation Tool

In this study, we have developed an evaluation tool, which is coined as Usability Evaluator (UE). This tool keeps a database, which is a list of rules, defined during the analysis process of usability guidelines. The proposed tool provides an environment for usability experts to evaluate mobile websites via list of usability rules. Fig. 2 demonstrates the flow chart for how UE is performed.

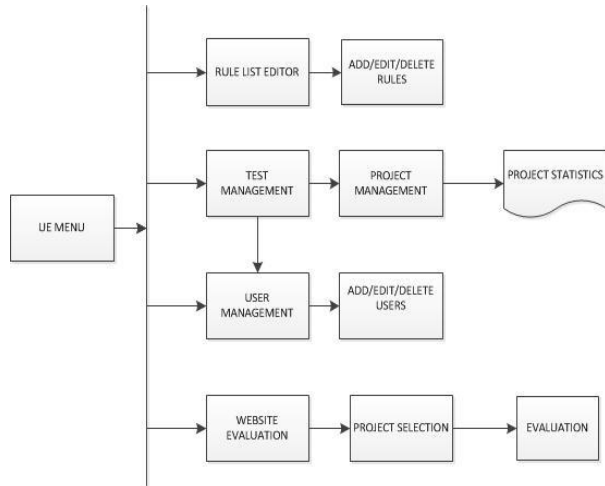


Figure 2. UE Flowchart

UE has “List Editor” menu as shown in Fig.3. Using this menu rules can be prioritized, edited and deleted. Experts can use “Site Evaluation” menu to criticize websites according to rules. UE can calculate percent of success on each rule.

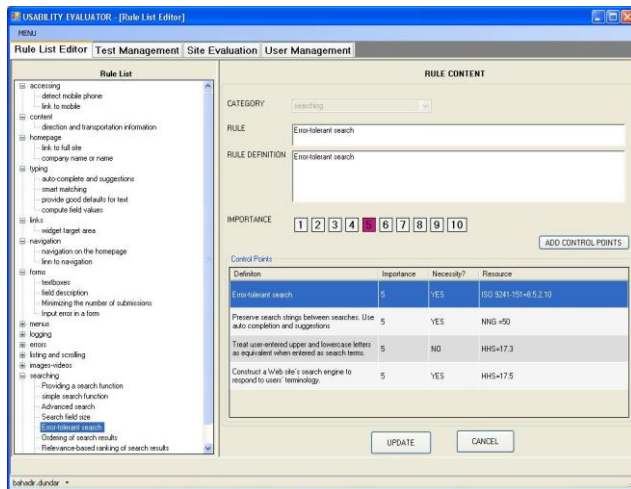


Figure 3. UE Rule List Editor

In the “Test Management” menu, evaluated websites can be monitored. Evaluation statistics can be pulled out depending on the website. EU user authorization can be defined by using “User Management” menu.

IV. GUIDED-BASED USABILITY EVALUATION IN PRACTICE

In this section, we demonstrate practical application of GBUEM on mobile websites. We picked 3 mobile news websites (News X, News Y, News Z) and 3 usability experts from our organization to make the evaluation.

In our study, we focused on touch screen based mobile phones, which have smaller screens than tablets. This evaluation was performed on Samsung Galaxy Note smartphone.

In this practice, weights of the rule categories were determined by the usability experts as shown Table IV. Weighted category scores are obtained by multiplying average category scores and category weights for each category. Total score is the sum of the weighted category scores.

$$\text{Weighted Category Score (WCS)} = \text{Weight of the Category (W)} * \text{Category Score (CS)} \quad (1)$$

$$\text{Total Score (TS)} = \Sigma \text{WCS} \quad (2)$$

TABLE IV. CATEGORY WEIGHTS

| RULE CATEGORIES | WEIGHTS | News X Category Score | News Y Category Score | News Z Category Score |
|-----------------------|-------------|-----------------------|-----------------------|-----------------------|
| Access | 5 % | 50 | 64 | 67 |
| Content | 10 % | 80 | 72 | 78 |
| Homepage | 5% | 50 | 90 | 80 |
| Typing | 5% | 20 | 40 | 25 |
| Links | 5% | 90 | 93 | 95 |
| Searching | 10% | 0 | 60 | 0 |
| Navigation | 10% | 90 | 93 | 89 |
| Forms | 5% | 43 | 68 | 40 |
| Menus | 5% | 100 | 70 | 74 |
| Logging | 5% | 50 | 90 | 55 |
| Errors | 5% | 90 | 95 | 88 |
| Listing and Scrolling | 10% | 83 | 64 | 62 |
| Images-Videos | 15% | 80 | 55 | 74 |
| Information | 5% | 55 | 65 | 80 |
| Total Score | 100% | 67% | 71% | 64% |

UE has the ability to show results as graphical demonstration based on each categories as shown in Fig. 4, Fig. 5 and Fig. 6.

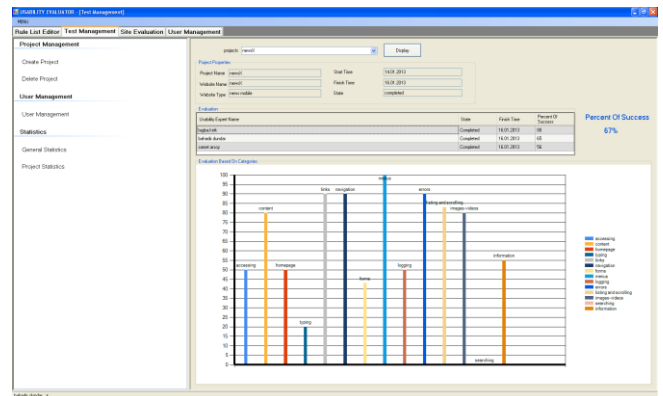


Figure 4. “News X” Evaluation Results of UE

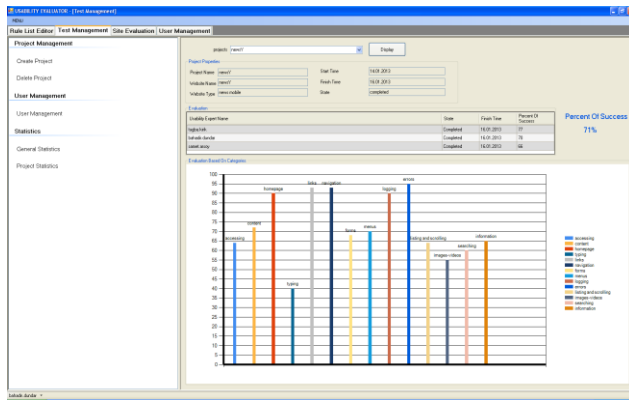


Figure 5. "News Y" Evaluation Results of UE

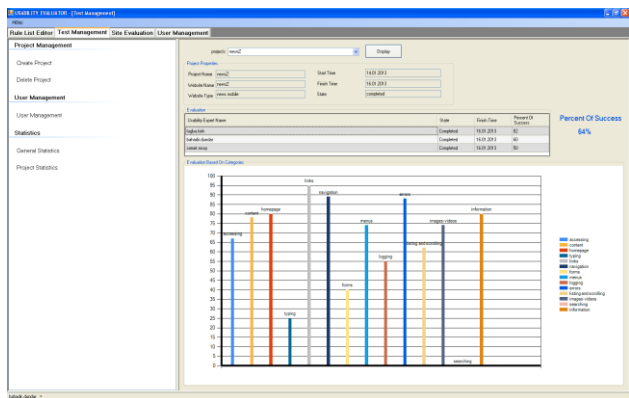


Figure 6. "News Z" Evaluation Results of UE

In this evaluation, usability success rate of these 3 mobile websites are 67%, 71% and 64% eventually. These results are very close to the result of Nielsen Norman Group participant test, which was 64% [14].

The basic findings in this evaluation are as following:

- One of these websites does not detect that user is connected through on a mobile phone and does not direct the user to mobile site.
- 2 of these websites do not include a link to mobile sites.
- One of these websites uses "wap" word in the site title instead of "mobile" or "m" word.
- One of these websites does not include a link to full sites.
- 2 of these websites do not include communication information, about link and privacy policy on their mobile websites.
- 2 of the websites do not have search option. Users are not able to search news in archive and in other sections.
- One of the websites plays the video on the full site if user clicks on the mobile page.
- One of the websites does not include at a link to navigation on every page of mobile website.
- 2 of the websites do not split the list into multiple pages and do not show one page at a time.

V. CONCLUSION AND FUTURE WORK

This study summarized background for mobile usability and gave statistics about mobile and usability issues. In this paper, we have proposed a methodology for user experts in evaluating the usability of mobile websites. We focused on performing this evaluation in a practical and simple way. We discussed the guidelines in the context of mobile usability. We introduced UE and described its operation. We used our tool for evaluating the usability of some mobile websites. Based on the results of this evaluation, we came up with some basic problems. Usability success rate of these websites will be increased by fixing these basic usability problems.

In the process of analyzing guidelines we surveyed literature on mobile usability and determined that there is no standard addressing mobile user interfaces. Some of the guidelines are inadequate and subjective. Considering increasing usage share and importance of mobile websites, there should be a standard for mobile user interfaces. If such a mobile usability standard exists, designers and developers could use this standard for designing consistent mobile user interfaces, which would result in higher mobile user satisfaction. This survey shows us that a standardization study on mobile user interfaces is needed.

This study is intended to help usability professionals in evaluation of mobile environments. We proposed a model to evaluate mobile websites, which didn't involve mobile applications. In our future studies, we will apply this evaluation model on mobile applications by changing the list of rules for UE. Apple's App Store and Google's Android Market user reviews will also be considered to evaluate mobile applications. This model will be applied on not only news websites but also shopping, banking and video sharing websites.

ACKNOWLEDGMENT

We would like to thank Software Testing and Quality Evaluation Center (YTKDM) of TUBITAK, for supporting us and allowing us to use their computer facilities for this study. As always we are really grateful for the help of the extended team of our department.

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