Heuristic Evaluation to Enhance the Usability

Anam Arshad
Department of Computing and Information Technology
The University of Lahore, Gujrat Campus
Gujrat, Pakistan
msit09153022@student.uol.edu.pk

Javed Anjum Sheikh
Department of Computing and Information Technology
The University of Lahore, Gujrat Campus
Gujrat, Pakistan
Javed.anjum@cs.uol.edu.pk

***Abstract*—This research investigated how heuristic evaluation can increase the effectiveness, efficiency and satisfaction of a user. It is also the most important factor along other measures as reliability and security. Numerous websites are designed by taking into consideration the perceptions of designers rather than focusing on the need of a user. The poor design distracts user's intentions from his task. Nielsen's Heuristic Evaluation (NHE) technique would be used to evaluate the usability of websites. NHE will be performed on existing website in order to know heuristics violations. The interface would be redesigned according to findings by Nielsen's heuristic evaluation technique. User's mental model could be also taking into consideration while redesigning the website. Neilsen's heuristic evaluation would be again performed to check the redesigned system at which extent eliminating the usability problem. The new design would be enhanced to attract user to spend more time and get material more ease, natural way and according to his mental model.**

Keywords-component; Usability; Usabilit techniques; Nielsen's Heuristic Evaluation; User's mental model

I. INTRODUCTION

Usability is referred to be as quality attributes that reckon easiness of user interfaces. During design process method for improving ease-of-use also defined as Usability (1). In terms of quality interface usability is considered important factor along with other measures as reliability and security (17, 12). Numerous websites are designed by taking into consideration the perceptions of web designers rather than focusing on the need of a user. While gratuitous amount of traffic on the internet and wasting users time is caused by little knowledge about usability engineering and user interface design of the website designer (18, 20).

For usability inspection uses Nielsen's Heuristic evaluation (HE) technique (4, 5). In practice point of view "Heuristic Evaluation (HE) and other qualitative tools" are known to work well, but concluded from studies that in many cases at HE "experts are better than non-experts" (29). Based on the points in which a small set of expert evaluators, guided by a set of usability principles known as heuristics, determine whether a system conforms to these and identify specific usability problems in the system (6).

Arrangement of this paper is as follows. Section 2 reports related work. Section 3 introduces method description. Section 4 depicts the expected outcomes. Section 5 explains the significance of this research.

II. LITERRATURE REVIEW

A. *Usability Techniques:*

Methods for evaluating the usability could be divided into the following three main categories (13, 14):

- *User Based Methods:* Usability problems are directly linked with the user. In this method problems which are identified while interacting with the interface are combined with user's performance and satisfaction. which is analyzed by using observation, interviews and questionnaire([15).
- *Evaluator's Methods:* In this method an interface is evaluated by a number of usability experts (evaluators). For these categories Heuristic Evaluation is widely used (15).
- *Tool based Methods:* In this method user interfaces are evaluated by various software tools to identify the usability problems. Numerous software by considering guidelines evaluated the quality of HTML code of a website (15).

***1) Evaluating the Usability of different Websites*:** This section examines the studies about evaluation of usability of different sites. Different types of method were used in these studies to recognize the usability problems. Astani and Elhindi (21), for example, implemented the heuristic evaluation method to analyze the usability of the top 50 colleges and universities. These two experts organized this study and measured sites based on following five attributes: Information content, navigation, usability, customization, download speed and security. The authors detected usability problems mainly old content and inappropriate layout (21).

Kostaras and Xenos (22) implemented the heuristic evaluation method to analyze the usability of the website of the Hellenic Open University using the ten usability heuristics suggested by Nielsen. They recognized only 38 usability problems on the university website related to: Lack of navigational support links, inconsistency problems (e.g. a variation of font sizes was used), errors in the internal search function, and inappropriate design of menu (22).

2) Usability Features for Websites: This section evaluates studies in the literature about identification of the relative importance of website features from users' perspective. For example, Astani (23) arranged a study that recognized the most, and least important features on a university website from student's point of view. The results displayed the four most important features as follows: Online admission applications, search tools, simple and clear text, and resources. However, the four least important features were related to the introduction of the site to: A site's purpose statement, school history of excellence, major local business and interests, and a link to the region's weather (23). Competent website designs and easier navigations promote shopping enjoyment (24). Usability is a critical element in the success of e-government websites (25). E-government solutions must regularly observe and increase the usability of their websites to engage and serve users (26).

In this modern time of Information and Communication technology, knowledge far away from teaching resources could be possible. "Any time, and any place" it is the most complete advantage of e-learning which is attracting more people now a days and useful for those teachers and students who reside far away from schools and universities. Making remote data and tools available to users are dependent on their different factors, such as cultural background, technical experience, technological equipment, and physical/ cognitive abilities (16).

It is the demand to provide facilities like, usability and accessibility at its vast level (16, 2) by neglecting the digital divide phenomenon. Squires and Preece (3) claim that in order to adopt educational goals usability feature of educational applications are not concern of researches. The assertion of these authors at this point that "there is a need to help evaluators consider the way in which usability and learning interact" (3) as the usability feature is not only for providing interactive interface but also for appropriate learning task (16).

Dringus (9) proposed heuristics evaluation to evaluate websites by using usability evaluation methods (Nielsen's heuristics) (7). User's evaluation of Interactive Computers System by questionnaire that were developed to address the needs and challenges of users of interactive systems (8, 10). There is a clear need for further elaboration and empirical validation (3). The design of any application deserves special attention and designers need appropriate guidelines as well as effective evaluation methodologies to implement usable interfaces (1, 16).

B. Heuristic Evaluation:

For usability inspection uses Nielsen's Heuristic evaluation (HE) technique (4, 5). In which a small set of expert evaluators, guided by a set of usability principles known as heuristics, determine whether a system conforms to these and identify specific usability problems in the system (6).

According to the ten heuristics points of Nielsen's Heuristic evaluation (4, 5) evaluates the usability of the official website of Gilgit&baltistan province.

Website: http://www.gilgitbaltistan.gov.pk/Default.aspx

Ten heuristic points of NHE are as follows (28).

1) Visibility of system status: "Always keep users informed about what is going on. Provide appropriate feedback within reasonable time".

Evaluation:

- Website has a visitor counter widget. Visitor hit is a good widget but there is conflict in "visits" word. It would be good if use visitors instead of visits.

Figuer 1

- There is no breadcrumbs trail. This is important because it acts like a road map to all the different areas and information contained within the website. If the navigation is clear, visitors will stay and have a good experience.

Figure 2

- This section is supposed to be a search bar but it is blank. A web design is considered incomplete without search functionality.

Figure 3

- Jacob Neilson proposed the idea of using blur color for hypertext link. This became the convention to indicate text links with blue color (27). In this website "DHS Gilgit…Last 1" is indicated as a link but it's not working.

Figure 4

2) Match between system and the real world: "Follow real-world conventions, making information appear in a natural and logical order".

Evaluation:

- Term "Financial Curve" may not close to visitor. The terms should be used which are common. And users easily get the desired understanding.
- There is spell mistake of "Publication". In an official govt. website, such type of negligence can affect the credibility.

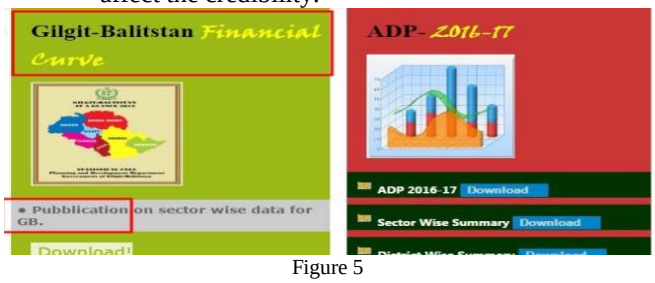

Figure 5

3) User control and freedom: "Users often choose system navigation to move between pages. Provide fully working and live navigational links with support of easy back and fro navigation without having to use browser buttons manually" (28).

Evaluation:

- No navigation bar is given so user can't freely move on site.

4) Consistency and standards: "Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions".

Evaluation:

- There is conflict in logo color. The color of logo should be same to maintain consistency.

Figure 7

- Color Scheme is not suitable.

Figure 8

- The pictures on website are not properly aligned.

Figure 9

5) Error prevention: "Even better than good error messages is a careful design which prevents a problem from occurring in the first place".

Evaluation:

- "About us" tab contains the basic information about an organization or about that specific website but here "About us" tab is not functional.

Figure 10

- Some links in departments are dead and some links are without any appropriate message.

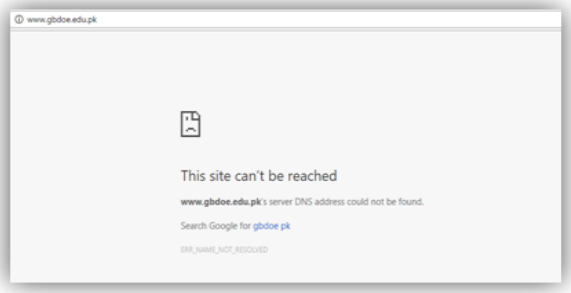

Figure 11

Figure 12

6) Recognition rather than recall: "Make objects, actions, and options visible".

Evaluation:

- It is a good point that captions are used with relevant pictures. This can help in achieving the goal of recognition rather than recall.

Figure 13

7) Flexibility and efficiency of use: "Accelerators -- unseen by the novice user -- may often speed up the interaction for the expert user so that the system can cater to both inexperienced and experienced users".

Allow users to tailor frequent actions.

Evaluation:

- Below is good from admin point of view but it is confusing for a normal user. There should mention that which belongs to admin and which belong to visitors.

Figure 14

8) Aesthetic and minimalist design: "Dialogues should not contain information which is irrelevant or rarely needed".

Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

Suggestion:

- There must be search bar for user's ease.

9) Help users recognize, diagnose, and recover from errors: "Expressed in plain language (no codes), Precisely indicate the problem, Constructively suggest a solution".

Evaluation:

- Not clearly mentioned "check mail" etc belongs to admin side or visitor as per figure 14.

10) Help and documentation: "Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Help information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large".

Evaluation:

- There is no site map or documentation in site for guideline.

C. Problem Statement:

Usability is referred to be most important factor in the quality of user interface. Numerous websites are designed by taking into consideration the perceptions of web designers or the authority members rather than focusing on the need of a user (18). Making user to spend their most of the time in order to use poorly designed interface. This distracts user's intentions from his task to understand interface. The usability of websites would be evaluated in terms of usability, accessibility and effectiveness by providing them natural and intuitive interface and good usability.

D. Research Questions:

This research investigated how usability evaluation can increase the effectiveness, efficiency and satisfaction of a user. Therefore, the research question is as follows:

"How can usability evaluation improve the user interface design?"

The main research question has been split into the following sub-questions:

SRQ1: How does evaluation influence design?

SRQ2: How can evaluation identify areas for improvement?

SRQ3: How can these areas be used for design?

In order to investigate the abovementioned research question, the study aimed to achieve the following specific aims and objectives.

E. Aims:

The research addressed the above research questions by investigating:

- How to understand Usability techniques
- How these techniques can be leveraged for user interface design
- What impact these techniques have on evaluation adoption.

F. Objective:

The objectives of the research are:

- To understand how usability evaluation can increase the effectiveness, and efficiency in order to design interfaces
- To develop a process model
- To develop and evaluate experimental interface design

III. METHODS:

A. Participant

Websites usability would be evaluated by 3-5 experts according to the Neilsen's heuristics. Neilsen's heuristic evaluation leads to know the usability problems which user is facing.

B. Methodology:

Neilsen's Heuristic Evaluation (NHE) technique would be used to evaluate the usability of websites. NHE will be performed on existing website in order to know heuristics violations.

The interface would be redesigned according to the evidence which is received after evaluation. User's mental model could be also taken into consideration while redesigning the website. Neilsen's heuristic evaluation would be again performed to check the redesigned system at which extent eliminating the usability problem. The new design would be enhanced to attract user to spend more time and get material with more ease, natural way and according to his mental model.

Usability of site would be enhanced by providing more ease, natural and accessible interface to user.

IV. EXPECTED RESULTS:

By applying all proposed methods on existing websites the interface would be redesigned according to findings of Nielsen's heuristic evaluation technique. User's mental model could be also taken into consideration while redesigning the website. Nielsen's heuristic evaluation would be again performed to check the redesigned system at which extent eliminating the usability problem which user is actual facing while interacting with interface. Usability of site would be enhanced by providing more ease, natural and accessible interface to user.

V. SIGNIFICANCE:

Taking into consideration need of the user usability, accessibility and effectiveness of interface would be enhanced which will attract user and provide more ease to efficiently spend their time on website and get material which actually they need rather than wondering and wasting time.

REFERENCES

[1] Holzinger, Andreas. "Usability engineering methods for software developers."Communications of the ACM 48.1 (2005): 71-74.

[2] Li, Yan, and Maria Ranieri. "Educational and social correlates of the digital divide for rural and urban children: A study on primary school students in a provincial city of China." Computers & Education 60.1 (2013): 197-209.

[3] Squire D, Preece J. " Usability and learning: evaluating the potential of educational software." Comput Educ(1996) 27(1):15–22.

[4] Nielsen, J."Finding Usability Problems through Heuristic Evaluation." In: Proceedings of the SIGCHI Conference on Human factors in Computing Systems(1992): 373-380. Monterey: ACM Press.

[5] Nielsen, J. "Heuristic Evaluations." In: J. Nielsen & R.L. Mack. (Eds)(1992), Usability Inspection Methods. New York: John Wiley & Sons.

[6] Ssemugabi, Samuel, and Ruth De Villiers. "A comparative study of two usability evaluation methods using a web-based e-learning application."Proceedings of the 2007 annual research conference of the South African institute of computer scientists and information technologists on IT research in developing countries. ACM, 2007.

[7] Nielsen J. "Usability Engineering." Academic Press(1993), Cambridge

[8] Shneidermann B. "Designing the User Interface." Addison-Wesley(2003).

[9] Dringus, Laurie P. "An Iterative Usability Evaluation Procedure for Interactive Online Courses." Journal of interactive instruction development 7.4 (1995): 10-14.

[10] [Parlangeli, Oronzo, Enrica Marchigiani, and Sebastiano Bagnara. "Multimedia systems in distance education: effects of usability on learning."Interacting with computers 12.1 (1999): 37-49.

[11] Zaharias, Panagiotis, K. Vasslopoulou, and Angeliki Poulymenakou. "Designing on-line learning courses: Implications for usability." Scientific Journal on Applied Information Technology 1.1 (2002).

[12] Saeed, Saqib, Irfan Ahmed Malik, and Fazal Wahab. "Usability evaluation of Pakistani security agencies websites." International Journal of E-Politics (IJEP) 4.3 (2013): 57-69.

[13] Hasan, Layla. "Evaluating the Usability of Educational Websites Based on Students' Preferences of Design

Characteristics." International Arab Journal of e-Technology 3.3 (2014): 179-193.

[14] Saeed, Saqib, et al. "Role of usability in e-government and e-commerce portals: An empirical study of pakistan." Life Science Journal 10.1 (2013): 8-13.

[15] Gul, Hina, and Madeeha Saqib. "Usability Evaluation of an Educational Website in Saudi Arabia." VAWKUM Transactions on Computer Sciences 8.2 (2015): 1-9.

[16] Ardito, Carmelo, et al. "An approach to usability evaluation of e-learning applications." Universal access in the information society 4.3 (2006): 270-283.

[17] Fernandez, Adrian, Emilio Insfran, and Silvia Abrahão. "Usability evaluation methods for the web: A systematic mapping study." Information and Software Technology 53.8 (2011): 789-817.

[18] Astani, Marzie, and Mohamed Elhindi. "An empirical study of university websites." Issues in Information Systems 9.2 (2008): 460-465.

[19] Du Toit, Michael, and Cornelius Bothma. "Evaluating the usability of an academic marketing department's website from a marketing student's perspective." (2009).

[20] Hasan, Layla. "Heuristic Evaluation of Three Jordanian University Websites."Informatics in Education 12.2 (2013): 231-251.

[21] Astani, Marzie, and Mohamed Elhindi. "An empirical study of university websites." Issues in Information Systems 9.2 (2008): 460-465.

[22] Kostaras, Nektarios, and Mixalis Xenos. "Assessing educational web-site usability using heuristic evaluation rules." Proceedings of 11th Panhellenic Conference in Informatics. 2007.

[23] Astani, Marzie. "An empirical study of the effectiveness of universities' web sites." Issues in Information Systems 4.1 (2003): 14-20.

[24] Floh, Arne, and Maria Madlberger. "The role of atmospheric cues in online impulse-buying behavior." Electronic Commerce Research and Applications12.6 (2013): 425-439

[25] Youngblood, Norman E., and Jo Mackiewicz. "A usability analysis of municipal government website home pages in Alabama." Government Information Quarterly 29.4 (2012): 582-588.

[26] Scott, James K. "Assessing the quality of municipal government Web sites."State & Local Government Review (2005): 151-165

[27] Cappel, James J., and Zhenyu Huang. "A usability analysis of company websites." Journal of Computer Information Systems 48.1 (2007): 117-123.

[28] Zhang, Jiajie, et al. "Using usability heuristics to evaluate patient safety of medical devices." Journal of biomedical informatics 36.1 (2003): 23-30.

[29] Hearst, Marti A., et al. "Evaluating Information Visualization via the Interplay of Heuristic Evaluation and Question-Based Scoring." Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems. ACM, 2016.