User Experience (UX) and the Web Accessibility Standards

Osama Sohaib[1], Walayat Hussain[2], M. Khalid Badini[3]

[1, 3] Department of Computer Science & IT, University of Baluchistan
Quetta, Pakistan

[2] Department of Computer Science, Balochistan University of I.T. Engineering and Management Science
Quetta, Pakistan

Abstract

The success of web-based applications depends on how well it is perceive by the end-users. The various web accessibility guidelines have promoted to help improve accessing, understanding the content of web pages. Designing for the total User Experience (UX) is an evolving discipline of the World Wide Web mainstream that focuses on how the end users will work to achieve their target goals. To satisfy end-users, web-based applications must fulfill some common needs like clarity, accessibility and availability. The aim of this study is to evaluate how the User Experience characteristics of web-based application are related to web accessibility guidelines (WCAG 2.0, ISO 9241:151 and Section 508).
.

Keywords: *User Experience (UX), Usability, User-Centered Design (UCD), Web Accessibility*

1. Introduction

Information and Communication Technology (ICT), is an umbrella term that includes all technologies for the communication of information. Over the past two decades ICT has been an engine of growth and a major thrust in long periods of low-inflation and economic expansion. Not only in the educational and business sectors, are ICT applications also considered to be a tool for flexile everyday life [1]. From getting the course schedules and registered through mobile application in your handset, transferred the money using E-Banking services on your PCs in your bedroom, to downloading songs and watching video clips via your iPhone. ICT applications offer opportunities to realize more flexibility in time and space in both working life and private life. As ICT applications covers any product that will store, retrieve, manipulate, transmit or receive information electronically in a digital form. In business, ICT application is often categorized into two broad types of products. One is the products based on traditional computer-based technologies such an application run on personal computers, another is the products that based on digital communication technologies, which allow people and organizations to communicate and share information digitally [2]. Companies invest in new web sites/applications because the web is now the platform for doing business efficiently and quickly. Customer and end users is one of the key factors, to satisfy them, a web site must fulfill some common needs: availability, responsiveness and clarity [11]. The role of user experience (UX) is to make the products user responsive and design in such a way to satisfy users during their use in an effective and efficient manner, web accessibility has a similar concept. Therefore, web design should consider both aspects of user experience and web accessibility.

This paper attempts to explore the Rubinoff characteristics of web applications in web accessibility guidelines by addressing the following research question.

RQ: How the uses of web accessibility guidelines facilitate total user experience design?

The rest of the paper is organized as follows: Section 2 discusses characteristics of web application and provides some insight on the three web accessibility standards (WCAG 2.0, ISO 9241:151 and Section 508). Section 3 presents some related work and in Section 4 the approach is discussed. In section 5, the role of user experience design within these three web accessibility standards is evaluated. Finally, the study is concluded and leaves an open issue.

2. Background

In this section, we use the literature to present some background on UX and web accessibility.

2.1 User Experience (UX) in context of web applications

The fast-growing digital world force us to move further, human needs obviously more and more; or even beyond the existing PCs standalone application can handle. That is

why many ICT applications shifted from PCs standalone application to web-based applications. The basic benefits that most of developers and users consider on going online as the web-based application is, browser applications typically require little or no disk space, upgrade automatically with new features, and integrate easily into other web procedures, such as email and searching. Today's modern web pages allow personalized dynamic content to be pulled down by users according to individual needs, preferences and settings. Many kind of scripting languages, either server-side or client-side, which change regular internet browser to more or less an user interface, enhance the usability, flexibility, and performance of the web. In short, we can say Web Application is operating system independent. As the number of businesses embracing the benefits of doing business over the web increases, so will the use of Web Applications and other related technologies continue to grow.

However, among excessive websites available out there, only few are success, it is a matter of satisfaction of end-user. Usability in the context of web application does not covered only user interface rather includes the content or the information, and functionalities that application could perform. According to the Spool [3] – a usability guru, there are five major usability challenges that every web-based application developer must face. That is Scalability, Visual Design, Comprehensibility, and Fluidity of interactivity and Change Management. Those five challenges are just first few challenges that everyone could possibly face, however an excessive list of best practices in implementing, developing, and designing the web application are also available and widely known. The main concept of usability is still the same as it focuses on user experience, How to satisfy customer, and what customer would perceive from the product. According to Rubinoff [12], the characteristics of Use Experience can be viewed as a formation of four factors. Those are branding, usability, functionality, and content. The concept of UX s factors by Rubinoff is focusing on the end-user as the focal point of design and development.

- Branding covers all design and visual-related items within the web pages. This also involves desired organizational image that developer wishes for as well as the message, purposes, and strategies.
- Usability is generally ease of use that end-user would experience from the application. This entails accessibility and navigation.
- Functionality involves technological aspect of the product or application, underlies the interface that end-user operate with. Functionality factors cover both public and administrative functions.
- Content is the actual content of the site, the message, information, multimedia, or images beneath pleasant interface. The structure of information also reflects

the user experience, for example readiness and comprehensibility.

According to the Garrett [13] the element of user experience can be view from two aspects. One is task-oriented or viewing the web application as software interface. And yet another is information-oriented which also means web application as the hypertext system.

2.2 Web Accessibility standards

According to W3C [4], "*Web accessibility means that people with disabilities can use the web*". The web accessibility for disabled people has been a growing concern worldwide. According to ISO [2008], accessibility is defined as the "*usability of a product, service, environment or facility by people with the widest range of capabilities*". There are varieties of guidelines and tools to allow web accessibility but the most relevant ones are W3C, ISO and Section 508.

WCAG 2.0 (Web Content Accessibility Guideline)
The purpose of WCAG 2.0 is to facilitate the disabilities, to help access, retrieve, understand, and operate the information, content, and media presented within web pages According to the four principles the web content should be [5].
- Perceivable
- Operable
- Understandable
- Robust

ISO 9241-151:2008, Ergonomics of Human-System Interaction: Guidance on World Wide Web user interfaces
The usability aspect of ISO 9241:2008 falls into the part of 151 – Guidance on World Wide Web user interface, which talks about on the usability of web application's user interface. ISO 9241-151 focuses on the design aspects, and provides design guidance and recommendations in four major areas which are [6] [14].
- Purpose and strategy
- Content and functionality
- Navigation and interaction
- Media design and presentation

Section 508
Section 508 of the Rehabilitation Act applies to the federal agencies [7], which require that e-government web sites to be accessible to people with disabilities. Our interest is in §1194.22 (Web-based intranet and internet information and applications), standards for the implementation and web site design. The criteria for web based information is based on web accessibility initiative (WAI) developed by World Wide Web Consortium (W3C).

3. Related work

Web usability has become one of the key success factors due to the rapid growth of web application worldwide. It is very difficult to create web standards to represent usability practice. The quality of web sites is often inadequate, and web designers hardly consider basic web principles, such as accessibility. [8][9][10][11].

Quesenbery [8] analyzed three well-known usability standards ISO 13407 – Human-centered design process for interactive systems, ANSI 354. The goal of all the usability standards is to increase the level of usability of the web application but these standards are limited in scope.

Signore [9] also proposed a quality model to fix errors through re-engineering. The five dimensions considered by the quality model are correctness, presentation, content, navigation and interaction.

Jaeger [10] discussed the multi method user-centered study of the accessibility and the result shows that the further improvement is needed between e-government Web sites and user's channel of communication.

Sohaib and Hussain [11] identified the gap between usability and three web accessibility standards (WCAG 2.0, ISO 9241:151 and Section 508). The authors evaluated that how Spool [3] usability challenges of web-based application are related to web accessibility guidelines.

4. The Approach

The aim of this work is to evaluate, whether the web quality standards meet the Rubinoff usability characteristics [12] in web applications or not and to what extent it may be successful. The focus of the study is many online references and related literature that work as a basis for suggestion. In this evaluation, The five usability characteristics according to Rubinoff in web application as discussed in section 2.1 are; branding, usability, functionality, and content are in consideration with the web standards WCAG 2.0, ISO 9241-151:2008 and the Section 508 covering only §1194.22 (web-based intranet and internet information and applications).

5. Evaluation

The characteristic of UX which is adopted here belongs to Rubinoff [12], due to the fact that it more conforms to the UCD aspect. The result shows that the WCAG 2.0 is able to meet the basic demand of end-users more than the ISO 9241-151: 2008 and Section 508-1192.22, as summarized in table 1.

Characteristic 1 - Branding:
WCAG 2.0 generally focuses more on the technical

TABLE 1. SUMMARY OF THE EVALUATION

Rubinoff UX characteristics	WCAG 2.0	ISO 9241-151: 2008	Section 508-1192.22
Branding	✓	✓	✓
Usability	✓	✕	✓
Functionality	✓	✓	✓
Content	✓	✓	✓

implementation of content and media presentations. Only few criterions discuss the significant aspect of branding. The criteria which involve the image and branding of the organization or developers is section 2.4, under the navigable guideline, as it recommends the developer to have the page title, heading, labels. Hence this makes looks and feels of the web pages professional. Image and brand of the application are also affected from this. On the other hands, ISO 9241-151 also emphasis the importance of branding as it covers "Purpose and Strategy". In addition, Section 508- §1192.22 (paragraph i) focuses that frames shall be titled with text that facilitates frame identification and navigation.

Characteristic 2 - Usability:
Regarding ease of use, this is covered by WCAG 2.0 under its purpose of accessibility and usability by everyone including the disabilities and those who have difficulties in perceiving or operating the content and information. Every principle in WCAG 2.0 aimed toward ease of use. This can be seen from the benefits that the end-users would have if the website conforms to success criterion suggested. However, ISO 9241-151 does not discuss the issue of usability directly, but ISO 9241:2008 as the whole is also aiming on the road to usability, especially ISO 9241-11 a Guidance on Usability. There is also no direct discussion towards the usability of web based application in Section 508- §1192.22 but does guarantee the success over this challenge.

Characteristic 3 - Functionality:
Functionality issue had been discussed widely throughout the WCAG 2.0, from the guideline for presenting the content and media in the most suitable, readable, compatible and hence accessible forms to the interactivity and operable of the functions and navigation through the whole website in principle 2. ISO 9241-151 contributes basically one area of interest for content and functionality. Section 508- §1192.22 (paragraph n) also guarantee this characteristic.

Characteristic 4 - Content:
This is about the actual content of the site included text, images, and multimedia. WCAG 2.0 covers as many

aspects of content's accessibilities and presentations as possible, due to the evident of an extensive criterion that purely discusses about the information and content within the website. Likewise, ISO 9241-151 cover the aspect of content in its four areas of interest. Section 508- §1192.22 (paragraph d & i) also support content by addressing all the necessary information.

6. Conclusion and Future Work

In this paper, we have evaluated web quality standards criteria against the Rubinoff characteristics of user experience. The standards in the internet industry are in abundance, the right standard can be chosen that is useful and efficient enough to accomplish needs of end users. Effective usability becomes also vital for the design of web-based application. Therefore, it is essential to develop and implement suitable web design guidelines while keeping in mind the usability characteristics and challenges.

As future work, many groups of challenges and characteristics of web usability against web accessibility guideline are still waiting to explore

References

[1]. P. K. Ellegård, and P. E. Wihlborg, "ICT-Applications as Tools for Flexile Everyday Life - Methodological Considerations for making ICT-related Activities seen in Everyday Life" Home Oriented Informatics and Telematics. Sweden: The Tema Institute, Department of Technology and Social Change, Linköping University, 2003

[2]. Tutor2u Ltd. "*ICT - What is ICT?*", from tutor2u - learning resource and teaching materials for Business Education & the Humanities: [Online], Available: http://tutor2u.net/business/ict/intro_what_is_ict.htm, Retrieved 05 12, 2010

[3]. J.M. Spool, "Five Usability Challenges of Web-Based Application", User Interface Engineering: [Online], Available: http://www.uie.com/articles/usability_challenges_of_web_a pps, Retrieved 12- 07- 2010

[4]. S. L. Henry, "Introduction to web accessibility", [Online], Available: http://www.w3.org/WAI/intro/accessibility.php , Web accessibility initiative, 2011

[5]. Web Content Accessibility Guidelines 2.0. [online], Available: zttp://www.w3.org/TR/WCAG20, World Wide Web Consortium, 2008

[6]. N. Bevan, "Guidelines and Standards for Web Usability," HCI International 2005, Lawrence Erlbaum, 2005.

[7]. Section 508, [online], Available: http://www.section508.gov/index.cfm?FuseAction=Content &ID=3

[8]. W. Quesenbery, "Usability Standards: Connecting Practice Around the World," Proc of the 2005 IEEE International Professional Communication Conference, IEEE press, 2005, pp. 451-457.

[9]. O. Signore, "A Comprehensive Model for Web Sites Quality," Proc of the 2005 Seventh IEEE International Symposium on Web Site Evolution (WSE'05), IEEE press, 2005

[10]. T. Jaege, "Assessing Section 508 compliance on federal egovernment Web sites: A multi-method, user-centered," evaluation of accessibility for persons with disabilities, Government

[11]. O. Sohaib, W. Hussain, "Mind the gap! Usability in web application and web accessibility standards" Proc. 2010 International Conference on Intelligence and Information Technology (ICIIT 2010) IEEE press, 2010

[12]. R. Rubinoff, "How To Quantify The User Experience", SitePoint : New Articles, Fresh Thinking for Web Developers and Designers, [Online], Available: http://www.sitepoint.com/print/quantify-user-experience , 2004

[13]. J. Garrett, "The Elements of User Experience", [Online], Available: Jesse James Garrett: http://www.jjg.net/elements/pdf/elements.pdf , 2000

[14]. International Organization for Standardization (ISO). "Ergonomics of human-system interaction - Part 151: Guidance on World Wide Web user interfaces", (ISO 9241-151:2008), 2008

Osama Sohaib received the BS (Software Development) Hons degree from Hamdard University Karachi, Post Graduate Diploma of AIT (Asian Institute of Technology) in Information Management from AIT- Bangkok and MS (Software Engineering) degree from PAF-KIET (Karachi Institute of Economics and Technology), Karachi Pakistan, in 2005, 2008 and 2010 respectively. He is currently working as a Lecturer in Department of CS & IT in University of Baluchistan, Quetta Pakistan.

Walayat Hussain received the BS (Software Development) Hons degree from Hamdard University Karachi, Post Graduate Diploma of AIT (Asian Institute of Technology) in Information Management from AIT- Bangkok and MS (Computer Science) degree from BUITEMS Quetta, Pakistan in 2004, 2008 and 2009 respectively. He is currently working as an Assistant Professor in Department of CS in Baluchistan University of IT, Engineering and Management Sciences (BUITEMS), Quetta Pakistan.

M. Khalid Badini received the MCS, and MS (Computer Science) degree from University of Balochistan, Quetta Pakistan, in 2004, 2007 respectively. He is currently working as Head of the Department and as an Assistant Professor Department of CS & IT in University of Baluchistan, Quetta Pakistan.