

Evaluating the Accessibility and Usability of Top Saudi E-Government Services

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ABSTRACT

E-Government services offer citizens an easy way to accomplish their work anytime and anywhere. Ensuring the accessibility and usability of such services is crucial to citizens to allow smooth online transaction. In this paper we present an empirical study to investigate the accessibility and usability of a representative sample of top Saudi e-government services. The accessibility will be based on the compliance to WCAG 2.0 recommendations, and the usability will be based on expert reviews. Our evaluation results show that the examined e-Government services have one or more accessibility violations. On the other hand, in terms of usability, most services were usable and well designed, thus little work is recommended to make them more user-friendly and attractive to citizen.

Categories and Subject Descriptors

H.5.3 [Information Interfaces and Presentation]: Group and Organization Interfaces - Evaluation/Methodology; Web-based Interaction

General Terms

Measurement, Reliability, Experimentation, Human Factors, Standardization.

Keywords

Web accessibility, WCAG 2.0, Accessibility evaluation, Usability Evaluation, Form Evaluation, e-Services, e-Government, Saudi Arabia.

1. INTRODUCTION

Information Communication and Technology (ICT) has changed the people life and the way they interact. To leverage ICT growth for development and sustainability, governments and public agencies took serious steps to adopt ICT for their provided services which is known as (e-Government). In recent years, e-Government has grown widely, as it is expected to reduce costs and improve services delivery in the public sector.

E-Government services can be classified into three categorized: Government-to-Citizens (G2C), Government-to-Business (G2B), and Government-to-Government (G2G). (G2C) represents the interaction between the government and the public; here the government is the service provider, while citizens and residents are the public who benefit from these services. E-Government services can be for example: questions via e-mail, enquiries,

renewals, or any other electronic transactions. Yet, to take full advantage of these services, government services need to be technically accessible and usable for a wide variety of users. Nevertheless, many government websites are not functioning well and do not meet user's expectations [11]. According to a study conducted by [11], a vast number of websites in both developed and underdeveloped countries "*did not meet either legal requirements or industry guidelines in providing fully accessible government sites*". E-Government services are usually situated in web forms, such as registration forms to subscribe to services or data input forms to search or inquire about information. In this sense, any kind of problems and obstacles citizens may experience while using such forms, may lead to increase dropout rates and frustrated citizens. Therefore e-government services' developers must pay special attention to optimize services' forms and make them as usable and accessible as possible.

Our current research conducts an empirical study that aims to evaluate the accessibility and usability of Saudi e-Government services, which responses to the following questions: (1) What accessibility guidelines are violated? (2) What are the most common types of accessibility problems? (3) How usable are the services?

The study will involve evaluating a representative sample of top Saudi e-Government services in terms of their accessibility, usability and effectiveness, among other factors, using experts' review as well as services adherence to Web Content Accessibility Guidelines (WCAG) 2.0 standard for the purpose of helping government agencies develop more effective ways of providing their services electronically. The rest of the paper is structured as follows: section 2 summarizes previous work in the field of e-Government accessibility and usability. Section 3 presents the methodology we used for data sampling and evaluation process. Section 4 presents and discusses our findings and section 5 concludes the paper with final remarks.

2. LITERATURE REVIEW

To help governments improve their service quality and increase the citizen access to government information and services, many studies and extensive research were conducted.

Several accessibility studies evaluated e-Government portals by checking their compliance with international standards such as WCAG or the legal requirements of Section 508 of the Rehabilitation defined by the US Congress. Choudrie [8] evaluated the accessibility, quality and privacy of the government web portals in 5 countries using automatic tools. Another study by [1] conducted a thorough analysis to measure accessibility of two GCC countries using automatic tools. Similarly, Hong [9] analyzed the accessibility of eight Korean and US government websites using automated and manual evaluation methods. However, West [15] conducted a comprehensive analysis of 1,667 government websites that measures the interaction level with users, such as website personalization and email updates of

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information. Kuzma et al. [11] analyzed e-Government sites of 12 countries from EU, Asian and African websites to determine their conformance to WCAG guidelines using automatic tools. Also, [12] checked the conformance of a sample of 130 UK sites to the WCAG standards. In order to get correct and more accurate results, some researchers did not rely on automatic tools, and performed manual accessibility evaluation [2].

Usability evaluation of e-Government, on the other hand, employed many methods such as compliance to ISO 9241, expert/heuristic evaluation, user testing, etc. For example, the author in [3] had investigated the usability of 14 e-Government websites in Saudi Arabia using heuristics evaluation checklist. Likewise, another study addressed the quality factors in Ministry of labor portal in Saudi Arabia [5]. Several expert evaluators carried out an empirical investigation of the website quality. The author in [13] presented usability guidelines by conducting a literature review of usability and accessibility of e-Government websites. Then, the author conducted an evaluation of the Hungarian e-Government portal through a usability testing approach to reveal the strength and weakness of Hungarian portals. Similarly, an empirical study was conducted on one of the UK e-Government website by [10]. Their approach was to evaluate the usability of current e-Government website, find the problems, and propose design solutions to make the website more user-friendly. Their experiment expressed improved user experience and satisfaction after proposed solutions were applied on the website.

From the previous studies we can see an increased interest in e-Government portals evaluation; however, little work has addressed the accessibility and usability of e-Government services. Therefore, our study will add to this research domain by evaluating Saudi e-Government services.

3. METHODOLOGY

This study aims to evaluate Saudi e-Government services by assessing their accessibility and usability. Focusing on top e-Government services will help in devising recommendations for improving their interaction for similar services.

3.1 Sampling

Saudi Arabia government offers innovative services through its national portal (www.saudi.gov.sa) that serves as a single sign-on portal, where citizens and residents can access around 1000 services and find all documents and reports from ministries and government agencies. The top 20 services in terms of number of transactions executed on 12th of June 2013 were:

- **Ministry of Foreign Affairs:** Visa Request, Family visit application, Updated contact details for holders of diplomatic and private passports, Suggestions and Complaints.
- **Ministry of Civil Services:** Pension Calculation, Identification Letter, Ask an Expert, Voting and Mailing List.
- **Real Estate Development Fund:** Apply for loan request and Inquire about the online application.
- **Ministry of Interior:** Public Query Hajj Eligibility, Query Traffic Violations, Query New Arrived Labors and Visitors, Public Query, Fingerprint Enrollment and Query NIN Expiry Service.

- **Public Pension Agency:** Employment Service, Inquire about the treatment of a statement of service working, Pension Agency, Scholarship applications for delegates and trainees.

3.2 Evaluation process

The evaluation took two approaches: (1) accessibility evaluation and (2) expert review. For accessibility evaluation, four evaluators evaluated the 20 services based on WCAG 2.0 principals¹. The goal was to identify whether the services met WCAG principles and at what conformance level, highlighting the pattern these principles are commonly violated in the e-Government services. For usability evaluation using expert reviews, Bargas-Avila et al. [7] 20 guidelines for forms usability were used.

4. RESULTS AND DISCUSSIONS

4.1 Accessibility Evaluation

Twenty e-Government services were evaluated for compliance with the WCAG 2.0 accessibility criteria. Each principle is analyzed in depth as described in the following section. Figure 1 illustrates the overall average percentage of violation results per guideline for each principle. In the following section we analyze in details each accessibility principle and identify which specific success criteria's are commonly violated when applicable.

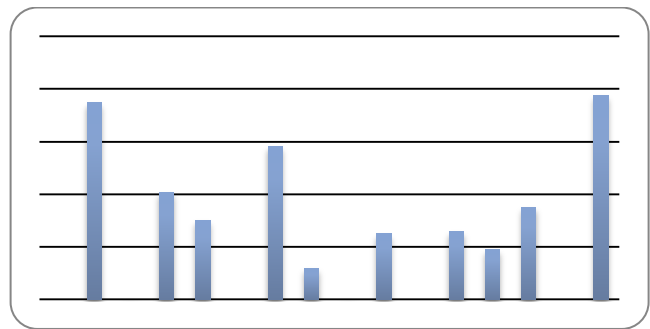


Figure 1. Overall Average Violation of accessibility Guidelines.

4.1.1 Principle 1: Perceivable

In regard to the perceivable principle, the most commonly violated guideline is Guideline 1.1 which ensures that there is a meaningful and equivalent text alternative for all non-text content. In few cases, this criterion is satisfied but mostly, in 75% of the services, one or two of the SC in this guideline are violated. The second highest commonly violated guideline is Guideline 1.3 which is related to creating site content that can be presented in different ways without losing information or structure (Adaptability). Although this guideline is identified to be of the lowest conformance level, level A, it's Success Criteria (SC) are found to be the highest violated Success Criteria reaching 85% violation in some of the basic criterion that include Data tables and forms. The Distinguishable Guideline 1.4 related to making the site easier for users to see and hear content which generally implies separating foreground from background, is generally

¹ WCAG 2.0 has become an international ISO standard (ISO/IEC 40500:2012) in October 2012. It covers a wide range of recommendations for making Web content more accessible to people with disabilities such as blindness and low vision, learning disabilities, cognitive limitations or combinations of these disabilities.

violated on 30% of the services. In all levels, there exist one or two violations in some criteria's that prevent this guideline from achieving even the basic level of compliance (level A). The most extensively violated SC in this guideline, violated at 80% of the evaluated services, is SC 1.4.8 (Visual presentation). This criterion ensures improved readability of content through visual presentation of blocks of text. However, this is a level AAA and not a basic level criterion. On the other hand, the Resize Text SC is considered more important and basic level (level A) criterion that is missed in over half of the services followed by SC 1.4.5 and SC 1.4.5 with 50% and 40% violation consecutively.

4.1.2 Principle 2: Operable

In regard to the operable accessibility principle, which is concerned with ensuring the operability of User interface components and navigation. Guideline 2.1 is the first evaluated guideline, which provides Keyboard Accessibility to make all functionality available through a keyboard. The first two Success Criteria in this guideline SC 2.1.1 and SC 2.1.2 tends to be rarely satisfied and are both identified to be of level A compliance. Whereas SC 2.1.3, which is a level AAA, is less violated. On the other hand, Guideline 2.2 tends to be less violated compared to other accessibility guidelines. This guideline is concerned of giving users enough time to read and use content of the website with no time limits. Guideline 2.4 ensures that the site is Navigable by providing ways that help users navigate, find content, and determine where they are in the site. Again none of the levels in this guideline is fully complied with. SC 2.4.6 (Headings and Labels) level AA, which define criterion that ensures informative page headings and labels are evaluated. This criterion is highly violated in 70% of the services. Also Headings (SC 2.4.10), which is a level AAA conformance criterion, is the second highest violated SC in this guideline and neglected in 65% of the sites.

4.1.3 Principle 3: Understandable

In regard to the understandable principle; which sets guidelines to ensure that information and the operation of user interface are understandable. The first guideline in this principle is Readability (guideline 3.1). This guideline defines SC that makes text content readable and understandable. The highest violated success criteria in this guideline is the pronunciation SC 3.1.6, in 70% of the services there is no mechanism provided to detect the pronunciation of words. The second highest neglected criterion is the language of page SC, where every web page is required to have a correct language declaration, this criterion is very important for screen readers. For example, if German is not indicated for a German-language website, the screen reader will read the site in English. Although this criterion is a basic level A criteria in accessibility principle 3, it is violated in 40% of the evaluated services. Guideline 3.2 is about Predictability; i.e. making sure Web pages look and operate in a predictable way. A number of Success criteria in this guideline are satisfied to some extent, such as consistent navigation (SC 3.2.3) and consistent identification (SC 3.2.4). On the other hand, the highest violated SC in this guideline is the Change on Request (SC 3.2.5), which allows users to be in control of what is happening. The On Focus and On Input guidelines are equally violated at 25% of the evaluated services.

4.1.4 Principle 4: Robust

The robust accessibility principle is the highest violated principle across all services. The evaluation of the Compatibility guideline, that ensures Maximum compatibility with current and future user

agents, including assistive technologies, indicates that both Parsing (SC 4.1.1) and Names, Roles and Value (SC 4.1.2) are highly violated at 85% and 70% consecutively. The markup used for building the services does not comply with standards and are not error free. Also in case of generated and self-programmed content, markup is not used in a way that supports accessibility.

4.2 Expert Review

This section focuses on the usability evaluation of e-Government services based on the 20 guidelines listed in [7]. An expert evaluator carried out the evaluation experiment and presented the findings in Table 1. Our finding highlights the importance of the 20 guidelines to improve user satisfaction, save time, and make a good impression to end-users, which will result in increased credibility of e-Government services. A closer look at the services shows that there was a great effort to create each service. The most outstanding factors about Saudi e-Government services were the clear navigation structure (e.g. the link to the service is placed on a noticeable place), concise layout, marking of required fields and optional fields, and asking for the necessary information only.

However, there were some violated guidelines. For example, in one of the ministry of Foreign Affairs services, the service has divided the form into two columns which violated the guideline "Do not separate a form into more than one column and only ask one question per row", it also violated the date format by making it as an input box without giving hints "For date entries use a drop-down menu when it is crucial to avoid format errors". When we entered the regular date format, we got an error even with following the requested format we were not able to successfully complete the form. This violates the guideline which states "it should clearly describe what the mistake is and how it can be corrected." These issues might hinder the user from using or trusting the service next time.

Table 1. Number of violations and their types for each Ministry

Name	Number of guidelines violation
Ministry of Foreign Affairs	3 Violations: Date format, Two columns form, and Not clear error message.
Ministry of Civil Services	2 Violations: Dropdown list is not alphabetic ordered, and Does not open E- service in new website.
Real Estate Development Fund	0 Violations: There are some services has the link but not available. It is better if they state these services under construction before the user click on one of them.
Ministry of Interior	1 Violations: Reset button
Public Pension Agency	3 Violations: Use dropdown list for two item not radio button, Displaying error before the form has been fill, and Reset button.

Another example of violated guidelines appears with the ministry of Civil Services, as one of its forms has a dropdown list of choices, however these choices are not alphabetically ordered instead of going through the whole list to look for the service, ordering the selection is best for the end user, this violates the guideline "If no meaningful sequence is possible, order them alphabetically". Also, for the ministry of interior, the only violation and most noticeable one is placing the reset button next to the submit button, this violates "Do not provide reset buttons, as they can be clicked by accident". Also the reset button is not grayed out or set aside from the submit button which violates "make them visually distinctive from submit buttons and place

them left-aligned with the cancel button on the right of the submit button.”

To sum up, most reviewed services are following the recommended 20 guidelines, however one recurring violation among all services was placing the input label text next to the input box not on top of it, this is against the guideline that states “To enable people to fill in a form as fast as possible, place the labels above the corresponding input fields”.

5. CONCLUSION

This paper presented an empirical study to investigate the accessibility of a representative sample of top Saudi e-Government services and their compliance to WCAG 2.0 recommendations as well as their usability based on expert reviews. To the best of our knowledge, this is the first time such a study has focused on measuring e-Government services accessibility and usability. Although some of the accessibility guidelines were satisfied by the services, the evaluation clearly indicates that almost none of the evaluated services fully comply with WCAG 2.0 accessibility guidelines. In analyzing the four main principles; perceivable, operable, understandable and robust, none of which have been totally achieved in level AAA. In most cases, even level A guidelines are violated for at least one of its success criteria. The three main violations were: Text Alternative (Level A), Keyboard Accessibility (Level A) and Compatibility (Level AAA). On the other hand, expert review findings show that Saudi e-Government services are almost well designed; little work is recommended to make them more user-friendly and attractive to citizen.

To conclude, we highly recommend web developers of Saudi e-Government services to adhere to the existing international accessibility standards and usability guidelines, adopt them to match their context, and follow a continuously assessment model to improve the limitations. The e-Governments services also need to spread the awareness and emphasis on the neglected features to deliver accessible websites for all citizens and residence especially for those with disabilities.

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