

## EFFECTIVENESS OF ACCESSIBILITY AND USABILITY OF GOVERNMENT WEBSITES IN SAUDI ARABIA

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### ABSTRACT

In today's rapidly changing world, information technology has significant impact in almost all sectors of daily life. With greater internet penetration among individuals and organizations use of online services is becoming indispensable. The increasing demand of electronic services has forced governments all around the world to provide online services to their citizens and residents. The government of Saudi Arabia has also realized the need of such services and it is working on an accelerating pace to provide excellent electronic services infrastructure to its citizens. Internet is an exciting technological tool that requires innovative design in order to be accessible to everyone. The purpose of this paper is to examine and evaluate accessibility and usability of e-government websites of Saudi Arabia. A subjective assessments method has been used to carryout the study. The results of the study have been compared with web accessibility tools. This study investigates the issues that are required to make a website accessible and examines accessibility guidelines. It also evaluates the Saudi government websites in context of W3C Web Content Accessibility Guidelines. The present study also presents some suggestions for improving e-government web sites to be more effective and beneficial to general public.

**Keywords:** E-government, usability, Saudi e-government, accessibility, Saudi Arabia.

### INTRODUCTION

Information and Communication Technology (ICT) has revolutionized the way individuals and organizations used to work. Now internet has become an essential tool that is used for information dissemination. People around the world use Internet mainly for email, product or organization information and health information (Goodman et al., 2003). With greater Internet penetration in society organizations started offering their services online so that customers access them whenever and wherever they want. People would like to use Internet as a transaction tool and now more people are using electronic transactions in different areas of their daily life (e.g. banking, shopping) due to less effort and quick service. Governments also have realized the significance of Internet and seem to be undergoing transformation to use Internet to deliver services and information according to these time and effort expectations (Abdulkarim, 2003). More than 160 countries worldwide have started e-government project, creating a major market for IT vendors and service providers that facilitate public organizations in adoption of technology (Qureshi, 2005).

E-government has been defined by some researchers in terms of specific actions (e.g. obtaining documents, accessing information, creating a sharing database) or simply as the automation of services. E-government concepts introduced in public administration in late 1990s

(Moon, 2002). There are issues involve in e-government such as security and privacy, diverse educational background of users, accessibility issues, prioritization of e-government over basic functions of government, building citizen confidence in e-government whether certain forms of government do better with e-government than others (Jagear, 2003). E-government has been thought as a best tool for serving citizens in a country and almost all countries have been trying to design and implement e-government. The government of Saudi Arabia has realized the effects of information technology in the economy and therefore special attention has been given to information technology that has brought a huge change in the last forty years.

Governments around the world especially in Gulf region are providing funds to the e-government projects in order to meet their society's increasing cyber skills. In every part of world from industrialized countries to developing ones governments is putting information online to provide better services for citizens (Chircu *et al.*, 2005). Currently Saudi ARAMCO, Saudi Arabia Basic Industries (SABIC), Saudi Telecommunication (STC), Saudi Arabian Airlines and banks are using state-of-the-art technologies in their applications. The government of Saudi Arabia has also realized the significance of e-government and to achieve the aim of e-government a program called YESSER has been initiated that is a user-centric and it focuses on governments services to be provided to individuals and businesses. The user-centric vision for Saudi Arabia's e-government initiative is

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summarized as ‘By the end of 2010, everyone in the Kingdom will be able to enjoy- from anywhere and at anytime – world class government services offered in a seamless, user friendly and secure way by utilizing a variety of electronic means ([www.yesser.gov.sa/english](http://www.yesser.gov.sa/english)).

As the Internet is fast becoming a major source of information and services, a well designed e-government website has become an essential so that citizens can access public information and improve their participation. Government websites can serve as a tool for both communication and public relations for the general public. Information and data can easily be shared with and transferred to external stakeholders (Moon, 2002).

The Web Accessibility Initiative (WAI) was established by World Web Consortium (W3C) in 1997. The W3C publishes Web Content Accessibility Guidelines (WCAG), which provide a series of checkpoints for web content development. These checkpoints are broken down into three priorities depending on their impact on accessibilities. Table 1 shows each priority with its description

Table 1. Web Content Accessibility Guidelines (WCAG) Priorities

Priority	Description
Priority 1	A web content developer must satisfy this checkpoint. Satisfying this checkpoint is a basic requirement for some groups to be able to use web documents
Priority 2	A web content developer should satisfy this checkpoint. Satisfying this checkpoint will remove significant barriers to accessing web documents
Priority 3	A web content developer may address this checkpoint. Satisfying this checkpoint will improve access to web documents

The W3C has been promoting web accessibility and according to it a web accessibility in general term is defined as “people with disabilities can use the Web... more specifically [they] can perceive, understand, navigate and interact with the Web” (Henry, 2006). Accessibility is considered as a subset of usability where problems related to usability may affect to all users equally apart from ability or disability (Thatcher *et al.*, 2003). Accessibility can be dealt with as a part of usability evaluations process. Usability is defined by the International Standards Organizations (ISO) as ‘the effectiveness, efficiency and satisfaction with which specified users achieve specified goals in particular environment’ (ISO, 2000; ISO, 1998). There is a

possibility that some accessibility problems may affect non-disabled users. However, all usability problems are within the scope of accessibility meaning that people with disabilities encounter all the same problems that people without disabilities encounter. The ISO has defined accessibility as ‘the usability of a product, service, environment or facility by people with the widest range of capabilities’ (ISO, 2003).

### Methodology

There are various methods to evaluate web accessibility that include standards review, user testing, subjective assessments and barrier walkthrough. These methods differ in terms of their usefulness, efficiency and effectiveness (Branjik, 2006). Standards review also called expert or conformance review is an analytic method based on evaluator’s opinions. This method depends on chosen checklist that range from standards issued by international bodies such as W3C, IBM or SUN. This method is costly and requires experienced evaluators. Several studies of usability evaluation methods have shown that user testing methods may fail in yielding consistent results when performed by different evaluators (Hertzum *et al.*, 2001).

Subjective assessments method has various benefits that include low cost and its ability to be performed remotely. This method does not require experienced evaluators and any specific criteria of pages being tested. In the present study we have assessed the usability of the government web sites that include effectiveness and efficiency and satisfaction thoroughly by users without any disability even such as color vision.

In the present study subjective assessments method has provided an opportunity to gain experience of general evaluators who had no experience of website evaluation.

We selected two websites for evaluation purpose i.e. Saudi Railways ([www.saudirailways.org](http://www.saudirailways.org)) and Saudi Post ([www.sp.com.sa](http://www.sp.com.sa)). The reason for selecting both of these websites was an increasing accessibility and usefulness among citizens ([www.arabnews.com](http://www.arabnews.com)). Another reason for selecting the two websites was being in complete dual versions (i.e Arabic and English) which we could not find in other websites at the time of decision. It was confirmed by the participants that they never had visited the websites before this study. Participants were given common tasks for evaluation purpose in different places. All participants were asked to rate the severity of problems on four point scale based on Nielsen’s heuristic evaluation method i.e. Cosmetic, Minor, Major or Catastrophic problem (Nielsen, 1994).

We asked 250 evaluators and provided them with 12 features to be evaluated manually in the websites that include logo of the company, office phone, address, email, contents, foreign language version, other link,

online payment option, links to other government sites, search option, subject index and audio/video clips. We received positive and complete response from 173 participants. Among the participants were 102 males and 71 females with a median age of 32 and varied education background from high school to research institutions/universities. Table 2 shows participants' computer literacy, use of internet, website knowledge and time consumption on computer.

Table 2. Participants Computer and Internet Skills.

Skill	Median	
	Male (1-5)	Female (1-5)
Computer Literate	5	4
Internet User	5	5
Website Knowledge	5	3
Internet Usage	3	2

Computer Literate - 1 = never; 2 = somehow; 3 = average; 4 = often; 5 = very often  
 Internet User - 1 = never; 2 = somehow; 3 = average; 4 = often; 5 = very often  
 Web Site knowledge - 1 = never; 2 = somehow; 3 = average; 4 = good; 5 = very good  
 Hours per day on internet - 1 = up-to 1; 2 = 2 to 4; 3 = 5 to 7; 4 = 8 to 10; 5 = more than 10

The results obtained by the evaluators were analyzed carefully and then it was decided to use well known tools available online to compare the outcomes of this manual evaluation with the available tools. We used EvalAccess 2.0 and CynthiaSays tools for evaluation of the websites. We also used W3C Markup Validator, Link Checker and CSS Validator tools to compare the conformance of web pages with the guidelines provided by W3C. EvalAccess evaluates web pages based on WAI and WCAG. The implemented web service for accessibility evaluation can process a web page from its URL or its HTML mark-up. The result of the evaluation process is formatted in XML following a predefined XML schema. CynthiaSays is a web content accessibility validation tool that has been designed based on WCAG guidelines. The Markup Validator is also known as HTML Validator that assists in checking web documents in formats like HTML, XHTML, SVG and MathML. The Link Checker checks the anchors (hyperlinks) in HTML/XHTML documents while CSS Validator tool validates CSS stylesheets or documents using CSS Validator.

**RESULTS AND DISCUSSION**

All participants were provided with the clear instructions about the 12 features to be evaluated and they were told to use their internet browsing experience and aesthetic features during the evaluation of the websites. There was a significant difference of evaluation of the websites

between male and female participants. We found the participants rated the severity of problems differently, for example, 81% male participants considered a page 'not found' as a catastrophic problem while 53% female participants rated the same page 'not found' as a general problem. Likewise, 77% female participants have given more consideration to the aesthetic features of the website over the contents while 42% male participants focused more on contents than aesthetic features. Since the website has English language version as well, therefore, participants evaluated both the versions. Table 3A shows the summary of the results of Saudi railways website.

Table 3. Web page and Problems Statistics in Saudi Railway Website.

Version	Mean	Male	Female	Standard Deviation
English	Number of pages visited	50.0	48.0	1.414214
	Number of pages with problems	7.0	6.0	0.707107
	Number of pages with severity	1.25	0.86	0.275772
Arabic	Number of pages visited	50.0	48.0	1.414214
	Number of pages with problems	3.0	2.0	0.707107
	Number of pages with severity	0.5	0.15	0.247487

For the Saudi Post website all the participants evaluated the above stated features and their findings are summarized in the table 3B:

Table 3b. Web Pages and Problems Statistics In Saudi Post Website.

Version	Mean	Male	Female	Standard Deviation
English	Number of pages visited	70.0	67.0	2.12132
	Number of pages with problems	3.0	4.0	0.707107
	Number of pages with severity	0.73	0.82	0.06364
Arabic	Number of pages visited	68.0	65.0	2.12132
	Number of pages with problems	0.65	0.34	0.219203
	Number of pages with severity	0.17	0.04	0.091924

### Evaluation by EvalAccess 2.0 and CynthiaSays Tools

Following analyzing results of the manual evaluation of both websites, we used online tools for accessibility evaluation. Following table IVA shows the results for Saudi Railways website obtained by using EvalAccess 2.0 that evaluates automatically the accessibility of web pages using the WCAG 1.0 from the W3C:

Table 4a. Web Pages Accessibility Results for Saudi Railways Website.

	Priority 1	Priority 2	Priority 3
Errors	2	47	23
Warnings	110	178	208
General Warnings	5	7	9

It is evident from the table 4A above that the website has two errors of priority 1 that must satisfy the basic requirement for some groups to be able to use web documents. Likewise, Priority 2 shows that there are some significant barriers that should be removed to access the web pages. Priority 3 shows that there are some areas which require attention for improving the website. Following table 4B shows the results for Saudi Post website using the same EvalAccess 2.0 tool

Table 4b. Web Pages Accessibility Results for Saudi Post Website.

	Priority 1	Priority 2	Priority 3
Errors	6	5	2
Warnings	27	13	4
General Warnings	5	7	9

The table 4B above shows there are six errors of Priority 1 that must satisfy the basic requirements for some groups to be able to use web document. However, there are less significant barriers and areas of improvement in the website as depicted by Priority 2 and Priority 3.

We also used CynthiaSays tool to evaluate both the websites and found that the Saudi Railways website could not pass the Priority 1, Priority 2 and Priority 3 checkpoints. The same tool passed the Saudi Post website the Priority 1, Priority 2 with 2 warnings and Priority 3 with 1 warning.

### Evaluation by Markup Validator, Link Checker and CSS Validator

We used different online tools to evaluate the web accessibility of the websites and following Table 4C shows the results:

Table 4c. Web Accessibility Evaluation by Different Tools.

Website	Markup Validator	Link Checker	CSS Validator
Saudi Railways	73 Errors, 1 Warning, Doctype: XHTML 1.0 Transitional	Invalid 13 links, valid 4 anchors	File not found
Saudi Post	6 Errors, 5 Warnings, Doctype: HTML 4.01 Transitional	Valid links, Valid anchors	No error found Validates as CSS Level 2.1

The above table 4C depicts that Saudi Railways web pages have significant number of errors in XHTML pages that were evaluated by Markup Validator. Also, there are various invalid links found by Link Checker. The CSS Validator tool could not find any CSS file on this website. However, it is evident that Saudi Post website has less number of error pages, all valid links and CSS level 2.1 files evaluated by the above stated tools.

### CONCLUSION

The present study has investigated the accessibility and usability of the two government websites. We have evaluated the websites manually and the results obtained were compared with the results obtained by using different tools. We found that the manual results are more or less same as of the results we obtained by using different tools. In the research it has been found that Saudi Railways (SR) website has more severity problems than Saudi Post (SP) website. We found that authorities of the websites are not well equipped to provide services electronically that are required to the Saudi citizens and residents. The authorities of the websites should ensure basic compliance with legal HTML, XHTML and CSS standards. This would entail regular validating and correcting code, but would mean that files could then be compatible with different browsers and platforms. To make the websites usable to all users the competent authorities need to take measures immediately in order to provide appropriate services electronically that are in compliance with W3C guidelines. Although disabled users have not participated in the present study but as Thatcher *et al.* (2003) have proposed that usability problems affect all users regardless of ability or disability.

This study also suggests that government should improve their websites in terms of providing necessary information in both English and Arabic versions equally so that all residents in the country are served effectively and efficiently. The evaluation of the two more familiar

websites indicates the plight of government websites that need to be developed according to W3C standards.

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