Web accessibility compliance for e-Government websites in the Gulf region

Muhammad Saleem

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Web accessibility compliance for e-Government websites in the Gulf region

This thesis is presented in fulfilment of the requirements for the degree of
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USE OF THESIS

The Use of Thesis statement is not included in this version of the thesis.
Abstract

The World Wide Web is a digital platform that helps people access and retrieve information in an accessible and equitable manner. However, people with disabilities can face a number of challenges when it comes to using the Web and accessing content on websites. According to Henry, web accessibility means “that people with disabilities can use the Web. More specifically, Web accessibility means that people with disabilities can perceive, understand, navigate, and interact with the Web, and that they can contribute to the Web” (2005, para.1). While different countries across the globe tackle issues of equitable access to the web via policy and legal instruments, not all countries and regions have shown progress in terms of meeting the requirements of the internationally recognised Web Content Accessibility Guidelines (WCAG 2.0).

This research aimed to evaluate web accessibility and practice in e-government websites in three Arabian Gulf countries. The study sought to identify accessibility issues and discover levels of conformance to the WCAG 2.0 web accessibility standards, while also eliciting awareness and knowledge of web accessibility in practice. Exploratory research methods were applied in this study, including case studies of nations. Automated website assessments, manual assessments and document analysis were amongst the instruments used within this research.

In terms of web evaluation, the findings from the evaluation conducted on e-government websites in relation to ten different sites from each of the three selected countries indicated that there was no clear evidence of an even minimal levels of accessibility features for people with disabilities. Furthermore, the webpages that were tested showed accessibility problems across nearly all aspects of the WCAG 2.0 guidelines.
In terms of accessibility awareness for the organisations e-government websites examined in this study, document analysis showed that none of the government websites of Kuwait, the UAE and Qatar made specific reference to web accessibility standards, or where they did, they were not implemented. The results showed that laws and policies did exist for people with disabilities, but did not seem applicable in terms of government run e-services or content. In fact, this interpretation revealed a lack of awareness within the websites examined, despite the existence of laws and policies designed to protect and support people with disabilities.

The aim of this study was to understand the role that web accessibility plays in gulf nation e-government services, and whether citizens of these nations are being supported in relation to access to online digital resources and services. Whilst other nations have seemed to recognise the need to make government services available to all citizens, including those with disabilities, this research finds that whilst Kuwait, the UAE and Qatar enshrine the rights of people with disabilities into law, these rights do not yet seem to have found their way to the digital domain.
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I certify that this thesis does not, to the best of my knowledge and belief:

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Date……………………………………….
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“Thanking others is part of gratitude to Allah.”

The Prophet Muhammad

This research could not be accomplished without the guidance, support, and help of some special individuals who provided their encouragement, insight, and expertise. This is an opportunity for me to show recognition to the contributions of those who supported me during the ups and downs of the research of my work.

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Finally, I would like to give special thanks to my family members, especially my late father, whom I owe a great deal and who has been a source of inspiration for me. Thank you for teaching me the importance of discipline and hard work in life. My special thanks goes to the person who has always sacrificed for me—my mother. She did a lot to enable me to continue my studies during times of crisis. This accomplishment would only be a dream without her as she has been a great source of motivation for me. This thesis would not have been completed without the understanding and support of these people. I thank you all!
DEDICATION

"Knowledge is power and it can command obedience. A man of knowledge during his lifetime can make people obey and follow him and he is praised and venerated after his death. Remember that knowledge is a ruler and wealth is its subject."

Imam Ali (AS)

I would like to dedicate this thesis to people who face serious health problems and to those who face disabilities in their lives. I believe that these are the people who have to struggle on a daily basis. The determination and courage of these people has always been a source of motivation for me and was throughout the journey of this thesis. I dedicate this work to them and hope that my efforts will highlight the issue. I believe that it will attract the attention of e-government employees in regard to this problem and that they will be able to play their part more efficiently when solving difficulties.

I also dedicate this thesis to my beloved father, who unfortunately did not stay on this earth long enough to see his son achieving his goals in studies, and to my mother for her never ending love. I also dedicate this to my brothers, sisters, and friends, who provided me with continuous encouragement to continue to work hard. Finally, I dedicate this work to my leader and my beloved country Kuwait.
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Chapter 1: Introduction

1.1 Background of study:

Today, the web offers a variety of services for citizens of many countries, and governments are aware of the need for information and communication technology (ICT) to enhance the delivery of information and services to their citizens. The Web has made a major difference to the way in which people work and communicate with each other, but it still requires innovation in order to improve the level of accessibility, particularly for those individuals who have disabilities (Abanumy, Al-Badi & Mayhew, 2005). In many nations, access to the Web is a driving principle, especially for governmental agencies that use online technology to offer a wide range of accessible services to citizens (Al-khalifa, 2012).

It is projected that e-government services will continue to expand, making it even more important that all individuals have equal access to those services, whether or not they are disabled (Kuzma, 2010). A 2007 review by the UK Office for Disability Studies determined that one convincing reason for use of the web by those with disabilities was to reach governmental websites and related official services (Al-khalifa, 2012). Ensuring that governmental websites are accessible is a necessity for everyone (Kuzma, 2010; Al-khalifa, 2012), and this is part of the standard of equal rights. In 2006, the UN Assembly enacted the Treaty on Rights of Disabled, the premise of which was to guarantee individuals with disabilities equal access to ICT (Kuzma, 2010; Al-khalifa, 2012).

Henry and McGee (2016, para. 1) stated:

The Web is fundamentally designed to work for all people, whatever their hardware, software, language, culture, location, or physical or mental ability. When the Web meets this goal, it is accessible to people with a diverse range of hearing, movement, sight, and cognitive ability. Thus the impact of disability is radically changed on the
Web because the Web removes barriers to communication and interaction that many people face in the physical world.

The World Wide Web Consortium (W3C) facilitated the creation of standards for web accessibility at the international level. The standards are intended to ensure that all people have an equal opportunity to utilise resources published on the Internet (Henry & McGee, 2016). Tim Berners-Lee, the W3C director, explained that the overriding benefit of the Internet is its universal nature. Everyone, regardless of disability, must have access (Henry & McGee, 2016). The W3C established the Content Accessibility Guidelines (WCAG) 2.0 with the main objective of increasing the accessibility of Internet content.

The use of these guidelines offers increased access to web content for people with many types of disabilities, including vision limitations, hearing limitations or loss, learning disabilities, and limitations in cognition, movement, speech or light sensitivity. For users in general, following the guidelines will improve the content of the specific web pages (Caldwell, Cooper, Reid & Vanderheiden, 2008).

In countries such as Australia, the United States and the United Kingdom, mature accessibility policy at the governmental level exists in the form of the National Transition Strategy (NTS), the Section 508 Workforce Rehabilitation Act of 1973 and the BS 8878 Web Accessibility Code of Practise.

In countries around the Arabian Gulf, such as Kuwait, the United Arab Emirates (UAE) and Qatar, evidence of accessible web design is limited, even in government-run websites. Examples of web accessibility studies in the Gulf region include those by Al-Khalifa (2012) and Al Mourad and Kamoun (2013).
1.2 The significance of the study:
Websites for e-government play an important role in Gulf countries, such as Qatar, the UAE and Kuwait. In each of these nations, there are individual websites to assist all citizens, including people with disabilities, and there appears to be a growing body of literature focusing on this region of the world.

Al-Khalifa (2012, p. 209) stated:

*Accessibility* is considered an important factor in the quality of any Web site. Failing to meet the minimum level of accessibility conformance might hinder many disabled people from benefiting from the services provided by a Web site.

The web is growing in importance as a resource for many aspects of living, including education, work, government, finances, health, recreation and more (Henry & Abou-Zahra, 2010; Henry, 2005). It is essential that full accessibility to the Internet is in place to provide opportunities and access to those individuals with disabilities. Access to the Web will help those with disabilities to participate more fully in society without discrimination (Henry, 2005).

There is a significant body of literature focusing on the issues of web accessibility in modern nations, particularly in terms of government policy and government websites adhering to the tenets of an accessible web. Accessibility policies and practical applications are far less evident in the Middle East, even in the rapidly modernising countries of Qatar, Kuwait and the UAE. This study will determine what level of web accessibility design and policy, if any, is evident in these three national environments, and what factors may be creating barriers to accessible design.
1.3 The purpose of the study:
The intent of this research is to identify any evidence of web accessibility practise, in the form of adherence to WCAG 2.0 standards, in the Gulf region e-government websites and to explore levels of digital accessibility awareness in government agencies. An evaluation of governmental attitudes in Gulf countries towards implementing web accessibility will be conducted. Of the six Arabian Gulf countries, this thesis will only review Qatar, Kuwait and the United Arab Emirates. One reason for this selection is that these countries are modernising nations that are becoming better known on the world stage due to sport, tourism and business. In addition, Qatar has established the Qatar Assistive Technology Centre (Mada) to support and help people with disabilities in using digital technologies. Furthermore, one of the Qatari government’s stated goals is to achieve the requirements of the Web Accessibility Guidelines (WCAG) version 2.0 by the end of 2015 (Mada, 2012). According to the government of the United Arab Emirates (UAE), “As part of our efforts to reach people with limited mobility and accessibility to the UAE Government services, we have designed the Emirates e-Government’s portal with enhanced features that will ease the experience of dealing with the UAE Government” (Government, 2014, para.1). This research will review and assess the level of accessibility in the websites of the government of the United Arab Emirates. Kuwait was selected as the third nation to be examined in this study, as Kuwait is the birthplace of the researcher conducting this study, and as an accessibility advocate, the researcher wished to determine if accessibility uptake was modernising as rapidly as the rest of the Kuwaiti nation.

1.4 Research Questions:
The main point of the research questions is to evaluate and discover the level and standard of e-government websites with regard to web accessibility requirements, including the Web
Content Accessibility Guidelines (WCAG 2.0). Furthermore, the research analyses and evaluates the level of awareness of web accessibility among web developers and government staff, and explores the laws, vision and mission of the Gulf governments in order to develop and implement web accessibility standards on their websites.

1.4.1 Primary Question:
To what level are web accessibility standards applied in Gulf State E-Government Websites?

1.4.1.1 Supporting Questions:
- Supporting Question One:

To what level do Gulf State e-government websites meet web accessibility standards (WCAG 2.0)?

The aim of this question is to determine the level of web accessibility in the three Gulf countries of Kuwait, the UAE and Qatar. Furthermore, the literature review shows that limited research has been done in the area of web accessibility in the Gulf region. On top of that, there is no evidence of research in terms of web accessibility in Kuwait. Some examples from the literature review show that most of the studies mention many accessibility errors in the e-government websites. Furthermore, according to Al-Khalifa’s study, “the accessibility of Saudi government Web sites is disregarded and immediate attention is needed” (2012, p.209). Another study by Tashtoush, Darabseh and Al-Sarhan suggested that, “a lot of attention must be taken by the Arab governments to build a good and accessible website for all users, even those with special needs” (2016, p.279). For that reason, this question will address the problems that people with disabilities might face while browsing e-government websites in these three countries. In order to address this research question, the research design evaluated ten e-government websites from each country being focused on in this research by using WCAG 2.0 as a main reference, whereby a real understanding will be
extracted to determine the level of commitment these countries have towards people with disabilities in terms of digital accessibility.

- **Supporting Question Two:**

What are the levels of awareness of web accessibility guidelines (WCAG 2.0) in Gulf State government organisations?

The reason for mentioning the level of awareness is because it was necessary to understand the level of commitment in each country in order to determine the level of understanding of web accessibility. According to Al-Khalifa, “it is apparent that the lack of awareness about the importance of Web accessibility on the managerial or development level is a key factor of accessibility problems” (2012, p.209). The three countries in the Gulf have been researched to find the level of staff awareness in regard to web accessibility for people with disabilities. Tashtoush, Darabseh, and Al-Sarhan’s study stated that, “the real accessibility can only be accomplished through users' feedback and full knowledge of their needs” (2016, p.281). In addition, it is important to determine whether these people possess a level of awareness about the difficulties faced by people with disabilities. The literature review indicates that studies about awareness issues were limited in the Gulf region. Therefore, this question is considered crucial to web accessibility.

1.5 **Structure of thesis**

The first chapter of this thesis established the rationale for conducting this research, whilst chapter two presents a literature review outlining the tenets and goals of web accessibility, including contemporary accessibility guidelines and assistive technologies. The literature review addresses international adoption of accessibility practice in terms of laws and policies, concluding with an examination of accessibility work taking place within the e-government space, including the middle east and gulf regions. Chapter three presents the research
methods, instruments and design used to conduct this thesis, including survey mechanisms which were utilised but ultimately did not return any usable data. Chapter four presents data gathered from automated and manual testing of e-government websites in the three target nations, with this data underpinning the ‘accessibility practice’ aspect of this research. Chapter five addresses the ‘awareness’ component of the thesis, with an analysis of law, policy and other website content for any mention of ‘disability’ or ‘disability rights’ so as to gain perspective on whether such topics were evident in government documents. Whilst it was hoped that this data would be aligned with survey results from the owners of e-government websites in the gulf region, no such data was forthcoming. Chapter six discusses the overall findings of the data presented in chapters four and five with an attempt to understand the ‘why’ of what the results are telling us. The thesis concludes in chapter seven with the research’s conclusions against the primary and supporting research questions.
Chapter 2: Literature Review

The review of the literature is divided into six main sections. The first section explores the definition of web accessibility, the importance of web accessibility, the history of web accessibility, web accessibility and usability, user classifications, common web accessibility issues and web accessibility guidelines. The second section outlines the definition and the importance of assistive technology; in addition, it also covers various types of assistive technologies that people with disabilities use in everyday activities. The third section illustrates the assessment methodologies that were applied to make websites accessible. Moreover, there are three accessibility evaluation and testing approaches, namely automated evaluation, manual testing and user testing which will be explained more in the third section. In the fourth section, the accessibility laws and policies of different countries, such as Australia, the United Kingdom and the United States, are examined, while the fifth section demonstrates e-government and accessibility, as well as the practise of accessibility in Australia, the UK and the US. The final section covers disability and accessibility in the Middle East.

2.1 Web accessibility:
The Web has played an ever-increasing role in people’s lives for more than two decades. People across the world use the Web for communicating, learning, shopping, and working, no matter where they are or what specific interests they may have. The universality of the web lies in its ability to be accessed by all types of users, regardless of age, gender, race or physical capability (Su & Lee, 2010). Moreover, according to W3C, the foundation of the web was “designed to work for all people, whatever their hardware, software, language, culture, location, or physical or mental ability. When the Web meets this goal, it is accessible to people with a diverse range of hearing, movement, sight, and cognitive ability” (Henry & McGee,
In order for all people to have equal access to the Web, websites and content need to be designed and presented in a fashion that does not create a barrier to their use. Web accessibility is the broad discipline that outlines processes and checkpoints for achieving such aims.

**2.2 Definition**

At the most basic level, the definition of web accessibility is about how people with disabilities are able to interact with the content of websites, in addition to supporting those individuals to use the Internet through web accessibility (Hollier, 2012). The main objective of web accessibility is not only to provide accessible websites for people with disabilities, but also to benefit people without disabilities (Hollier, 2012). According to Yesilada, Brajnik, Vigo and Harper (2012), the definition of web accessibility can be interpreted in numerous ways, depending on the context, whether in terms of people with disabilities, the relationship between accessibility and usability, different levels of interaction, and equity of access (Yesilada et al., 2012). Furthermore, the World Wide Web Consortium (W3C) defined this complex concept, stating that, “Web accessibility means that people with disabilities can use the Web. More specifically, Web accessibility means that people with disabilities can perceive, understand, navigate, and interact with the Web, and that they can contribute to the Web” (Henry, 2005, para.1). This result is similar to that reported by Lazar, Sponaugle and Greenidge (2004), that people with disabilities find it difficult to take advantage of the resources and opportunities offered by a website if it is not developed to be compatible with assistive technologies. Within the context of a website, Kennell defines accessibility as “the measure of how easily people with disabilities can perceive, navigate, access, and interact with electronic content and information” (Kennell, 2008, p.6).

AKGÜL & Vatansever (2016, p.202) stated:
Web accessibility can be defined as the degree to which a site is accessible to the largest possible range of people. The more people are able to access a website, the more accessible is the site.

Whether the user is temporarily suffering from a broken arm and cannot use a mouse or has a visual disability that requires an assistive device, most websites have accessibility barriers that prevent disabled users from effectively navigating sites” (Kennell, 2008, p.6).

2.3 The History of Web Accessibility

In order to understand the history of web accessibility, we first need to familiarise ourselves with the history of the World Wide Web. The World Wide Web (W3) was established by Tim Berners-Lee in 1989 (Cailliau, 1995). The ambitious project intended to make information more useful and accessible to people throughout the world (Cailliau, 1995). Berners-Lee envisioned the Web as “a tool for communicating,” and also stated that the web access allows you to “find out what other people mean [and] where they are coming from” (Lee & Fischetti, 1999, p.80). Figure 2-1 outlines the history of W3C and the Internet from 1979 to 2004. Although the aim of the World Wide Web project was to make the Internet accessible to everyone, people with disabilities had difficulty navigating websites. The web accessibility project was developed in response to this need, and was launched by W3C in 1996 (Dardailler, 2009). This project had a rocky start due to differing viewpoints and a lack of standard guidelines, which limited its ability to support users and programmes (Dardailler, 2009). The historical vision of web accessibility focused on standard guidelines, ideas, and educational tools (Dardailler, 2009). The Web Accessibility Initiative (WAI) was designed and developed by W3C in February 1997 with the express purpose of creating guidelines for designers, authors, developers and end users in order to make websites, videos, and other software more usable and accessible (Brewer, 2003). According to Updike, Jamie, McCarthy and John:
The W3C (World Wide Web Consortium) is a non-profit international group in which member organizations, a full-time staff, and the public work together to develop standards to make Web pages available to anyone using Internet technologies now and in the future. Within their broader mission, the W3C has a Web accessibility initiative (WAI) that contains a set of Web content accessibility guidelines to assist creators of Web pages in developing sites with features that enable individuals with disabilities to access Web content. (2006, p.34).

Figure 2-1 below demonstrates the timeline of W3C and illustrates the essential activities of the W3C from 1994 to 2001.

2.4 The Importance of Web Accessibility
Owing to the crucial nature of web technology, web accessibility has played a significant role in assisting developers, designers, and authors to make content, images, and videos equally accessible for people with disabilities and the rest of the general population (Abou-Zahra & Henry, 2010). Approximately 15% of the global population has some sort of disability (Visionaustralia, 2012), which represents a significant portion of potential web users and consumers worldwide. Web accessibility is not only related to people with impaired vision; it
also deals with different sectors of disabilities, such as hearing impairment, dyslexia, and arthritis (Vision Australia, 2012). According to the Vision Australia organisation:

Governments are legislating to ensure that accessibility issues are taken seriously, and commercial entities are looking at their own social responsibilities, as well as the financial benefits of making their products and services accessible to a larger consumer base. (2012, para.5).

Accessible websites and digital technologies provide the opportunity for disabled people to participate and integrate with other individuals and organisations in the digital world, as well as enhancing their decision-making process, improving their capacity to learn, and supplying access to potential employment opportunities (Vision Australia, 2012). In one particularly significant study from 2003, Loiacono (2003) explained that accessible websites are advantageous not only for people with disabilities, but also for everyone else. These results coincide with the concept of W3C, which aims to provide equal access to websites for people with disabilities (Henry, 2005). McLellan (2011) explained that web accessibility allows:

People with disabilities [to] do ordinary things: children can learn, teenagers can flirt, adults can make a living, and seniors can read about their grandchildren, and so on. With the Web, people with disabilities can do more things themselves, without having to rely on others. (McLellan, 2011, p.10).

Kelly, Sloan, Brown, Seale, Laukee, Ball and Smith (2009) argued that accessibility is not only about guidelines, and that other aspects ought to be considered, such as the context of use and the perspective of the user, in order to make websites accessible to everyone.

The Web is an important resource in many areas of life, such as education, employment and healthcare, among others. It is necessary that the Web be easy to access in order to offer
equal opportunities to people who have disabilities, as this can help them be more active participants in society (Rowland, Whiting & Smith, 2015).

Web accessibility is also important because it provides exceptional access to information and social contacts for many people with disabilities. This helps to make it easier to overcome obstacles to visual, audio and print media through the use of web technologies (Park & Lim, 2016).

For instance, in the past, the major way to obtain information was to read something in a newspaper or visit a library. This led to major barriers for people with disabilities, especially getting to a library, physically obtaining the needed resource, and finally reading it (Park & Lim, 2016).

Rowland, Whiting and Smith (2015) argued that, in organisations, web accessibility is required for laws and policies in certain cases. Such resources can be used to address legal and policy aspects in a firm in terms of their approach to meeting web accessibility expectations. Web accessibility is important in organisations, especially for corporate social responsibility (CSR) (Henry & Arch, 2012; Rowland, Whiting & Smith, 2015). It can affect the staff, stockholders and suppliers, among other people. Therefore, web accessibility is an important aspect of CSR and demonstrates that a firm is committed to offering equal opportunities. An inaccessible website can destabilise the other CSR efforts of a firm (Rowland, Whiting & Smith, 2015).

2.5 Web Accessibility and Usability
There is a crucial relationship between usability and accessibility within websites, and it is important to represent them together (Abou-Zahra & Henry, 2010b). As outlined before, the purpose of accessibility is to make websites accessible to everyone, including people with disabilities (Dias, Fortes, Masiero, Watanabe & Ramos, 2013). However, usability is defined as:
Designing products to be effective, efficient, and satisfying. Usability is part of the human-computer interaction (HCI) research and design field (which is much broader than usability testing). For web developers, a key aspect of usability is following a user-centred design (UCD) process to create positive user experiences (Abou-Zahra & Henry, 2010b, para.7).

Many developers have argued that accessibility guidelines limit the creativity of websites (Dias et al., 2013) and that developers believe accessibility guidelines limit usability features, such as animations, JavaScript and applets (Dias et al., 2013). Foley (2011) stated that even though a website has included accessibility and usability features by using automated validation tools, these validation tools do not mean that the website is fully accessible and usable (Foley, 2011). Furthermore, even when a website has been tested and no errors have been detected, people with low vision may still have a difficult time navigating some pages of the website (Foley, 2013). Babu, Singh and Ganesh argued that:

Blind users cannot participate effectively in routine Web-based activities due to the lack of Web accessibility and usability for non-visual interaction. We take a cognitive, user-centred, task-oriented approach to develop an understanding of accessibility and usability problems that blind users face in Web interactions. This understanding is critically needed to determine accessibility and usability requirements for non-visual Web interaction. (2010, p.74).

Petrie, Hamilton and King (2004) felt that the visual design of websites could be accessible and also interesting; however, most developers and designers believe that accessibility is only concerned with limited factors, such as the simplicity of the web pages and plain text in the websites, which does not present any obvious challenge to designers in creating highly interesting websites with accessibility features. Moreover, making websites simple, with plain text and a minimum of visual design, does not necessarily make them accessible to everyone; on the contrary, websites can be professionally designed and implemented and still be highly
accessible (Petrie, Hamilton & King, 2004). Petrie demonstrated that the designer ought to view accessibility as another challenge in visual design; this argument is similar to that of Pribeanu, Fogarassy-Neszly and Pătru (2014), who demonstrated that in many case studies, most websites had usability issues, such as inaccurate links, no Alt attribute for non-text content, confusing link descriptions and inappropriate heading orders. All of these issues rely on how well the designers understand usability structures. They also argued that, “web content is still difficult to use, if not completely unusable, for visually impaired people” (Pribeanu et al., 2014, p.339).

Pernice et al. (2014, p.6) argued that:

> Web usability is of much greater importance: Knowledge workers must be able to research company partners, vendors, and customers on the Web, and they must be able to exchange information and operate mission-critical applications on intranets. To truly achieve equal opportunity and broad benefits from the Internet, we must consider all users when we design, and stop treating one group three times better than others.

Usability is all about how natural or easy it is to use a website, while bearing in mind what users need from the website. However, simply having a usable website is not enough; website designers need to take into account other factors, such as accessibility and attraction.

2.6 User Classifications
Web accessibility implies a technology tool or process to help people with disabilities and special needs interact with and navigate the World Wide Web (W3C, 2005). Accessibility research covers a broad range of social, medical and cultural issues, and different user groups have different requirements that would allow them to participate in a connected world. Research and practise in web accessibility promotes social inclusion and equality of access.
According to the aforementioned WebAIM, approximately one-fifth of the global population has some kind of disability. It is essential and beneficial for businesses and governments alike to provide an equal opportunity for everyone. This, of course, includes people whose disabilities prevent them from accessing the Internet. Disabilities are divided into four types: visual, physical, auditory, and cognitive (Webaim, 2014). According to the Australia Network on Disability (AND), there are an estimated 3.4 million Australians with a physical disability and 1 in 6 Australian who suffer from hearing loss (AND, 2013).

Conway (2014b, p.3) stated:

In the most recent statistics, published by the Australian Bureau of Statistics in 2012, it was reported that slightly under one in five people stated they had a disability. A further twenty-one percent of the population (4.7 million people) reported that they had a long-term health condition that did not restrict their everyday activities. This total group of people who suffer either a disability or a long-term health condition numbers 8.9 million people, or over thirty-nine percent of the Australian population.

Moreover, there are an estimated 35 million blind or visually impaired people living in Arabic countries (Safhi, 2009). These statistics confirm that people with disabilities are no longer a minority population and they cannot be denied access to information in the digital world.

Visual disabilities may affect one or both eyes and include colour blindness, low vision, blindness, and deaf-blindness. There are a number of barriers affecting people with visual disabilities that a web developer should take into consideration, such as images, colours, visual orientations, navigation, and the ability to browse and utilise tools (WHO, 2014; Mandal, 2012; Freeman, Cole, Faye, Freeman, Goodrich & Stelmack, 2010; Abou-Zahra, 2012; NHS, 2013; WebAIM, 2013).
Physical disabilities, often referred to as “motor disabilities,” indicate a difficulty or weakness in muscular movement and control, incoordination of muscle movement, paralysis, joint problems, arthritis, and lost limbs (Queensland Government, 2015; Abou-Zahra, 2012; Disabled World, 2016; Accessproject, 2010; WebAIM, 2012).

People with physical disabilities may find it difficult to use fine motor skills, such as those necessary for clicking a mouse, selecting items, and typing (Abou-Zahra, 2012). Numerous supportive tools and options are available to people with physical disabilities. For example, an ergonomic mouse and keyboard, head pointer and mouse stick, joystick, on-screen keyboard, voice recognition, and many other options that allow a hands-free interface (WebAIM, 2012; Abou-Zahra, 2012).

Auditory disabilities may affect one or both ears. Some people with auditory disabilities are able to hear sounds, but cannot comprehend all speech, as background noise makes it very difficult. A hearing aid can help improve one’s ability to hear (WHO, 2016; WebAIM, 2013; Nordqvist, 2015; Abou-Zahra, 2012).

Some people with auditory disabilities primarily communicate through sign language, but not everyone with an auditory disability knows sign language (WebAIM, 2013; Abou-Zahra, 2012).

In conclusion, there are several types of people with visual, physical and auditory disabilities. The challenge of creating accessible websites is to ensure that they are suitable, provide benefits and are accessible to people with any type of disability. However, web developers inevitably face many obstacles, which will be explained in the next section.
2.7 Common Web Accessibility Issues:

This section illustrates the common accessibility problems that developers, designers and authors have applied on websites, and also the many studies that have demonstrated various web accessibility issues.

In 2005, Pennsylvania State University issued a report on the “Most Common Web Standards and Accessibility Errors” against section 508, which highlighted the most common errors in web accessibility. The report showed that the most common errors are as follows:

- Alt tag is missing for images
- There is no description for audio
- No JavaScript links are used
- There is no label for form section

Even though these were WCAG 1.0 issues, they are still amongst the most common issues showing above reported against WCAG 2.0 as well.

An article was published in 2008 by the founder of Webcredible, Trenton Moss, on the topic of “Ten common errors when implementing accessibility”. According to Moss (2008), the common errors that developers often make include:

- Images have no Alt tag
- The tab order changes without a good reason
- Access keys are not used
- The label of the form is empty
- A table summary is used without value

In 2008, the society of IT management published a report on the Five most common accessibility errors. Up to 75% of websites have similar errors; the most common accessibility errors are shown below:
• No alternative text for images.
• Inappropriate use of JavaScript.
• Errors in simple data tables.
• Errors in complex data tables.
• Use of features with a lack of accessible alternatives.

As later chapters will demonstrate, these common lists of accessibility errors are also common to the sites examined in this study.

Sloan (2010, p.218) stated:

The Web is richer for the use of graphics, not only for aesthetic purposes, but also as an effective information delivery channel. Therefore, the challenge of providing equivalent information in non-graphic format to those who cannot perceive graphical content has focused the attention of accessibility researchers for many years. Specifying an appropriate alternative for a graphic is widely seen as one of the most challenging tasks facing a web content author, and the challenge is proportional to the complexity of the image.

An article that was published in 2015 by Neelankavil mentioned that there are significant obstacles on the Web for most people with disabilities. Since the majority of web developers do not provide access to their web pages and tools, most people who have accessibility needs have a hard time using the Web, and sometimes, it is difficult for them to efficiently use the Web (Neelankavil, 2015). For instance, when a developer needs mouse interaction to make use of a website, people without a mouse have a very hard time accessing the content. Moreover, when a developer does not incorporate alternative text for vital images, blind people are unable to obtain the information from those images. Most of these obstacles also have an effect on older users who have accessibility needs due to age. However, in cases where websites are easy to access, they make it possible for people with disabilities to successfully make use of the Web (Neelankavil, 2015).
According to Wentz, Jaeger and Bertot (2015), inaccessible websites tend to contain keyboard traps, in which case users must navigate through websites by using the TAB key, only to get trapped in an element they cannot find their way out of. In the end, these users have to close the pages, move to the complaints section, or try another website.

All of the reports noted similar common accessibility issues; for example, no alternative text for non-text content, inappropriate use of JavaScript and inappropriate heading order.

Colour contrast is another common web accessibility issue. Having adequate colour contrast is vital for users who are visually impaired, particularly those with colour blindness and low vision. The best way to find out if there is adequate contrast is through the use of a colour contrast analyser (Park & Lim, 2016).

The other common accessibility issue that affects carousel and slideshow functions is that they sometimes do not have controls, namely the play, pause, forward and back arrows. In order to ensure that carousels or slideshows can be easily accessed by users, one must be able to pause, play, move forward and move back by using the buttons on the carousel (Leitner, Strauss & Stummer, 2015).

2.8 Web Accessibility Guidelines

The World Wide Web Consortium (W3C) has established a set of standards and guidelines regarding the implementation of accessible web technology, which different countries around the world are applying as they see fit, at either a national or local level (W3C, 2005).

People from different sectors, such as government, industry and organisations, have been involved in helping the W3C develop these web accessibility guidelines in order to make websites accessible for all people, including those with visual disabilities, physical disabilities and auditory disabilities (Henry & McGee, 2016). Creating websites with accessibility and usability features is an important aspect of the Web; however, without the web accessibility
guidelines, there would be yet another challenge for developers and designers to take into account when building accessible websites. The WAI has developed diverse accessibility guidelines, including:

- Web Content Accessibility Guidelines (WCAG)
- Authoring Tool Accessibility Guidelines (ATAG)
- User Agent Accessibility Guidelines (UAAG)

The Web Content Accessibility Guidelines 1.0 were introduced by the Web Accessibility Initiative (WAI) in 1999, the purpose of which was to inspire designers, developers and authors to make accessible websites and content (W3C, 2014). Moreover, following these guidelines makes websites accessible not only to people with disabilities, but to all users (Caldwell, Cooper, Reid & Vanderheiden, 2008). One of the benefits of using these guidelines is in helping users to navigate and find information quickly. The developers of authoring tools have been similarly directed to use these guidelines when developing and implementing accessible tools (W3C, 2014).

Web Content Accessibility Guidelines (WCAG) 2.0 is the updated set of guidelines from WCAG 1.0. However, WCAG 2.0 is more widely used to evaluate web accessibility, rather than WCAG 1.0 (Reid & Snow-Weaver, 2008).

W3C (2014, para.6) stated:

The Techniques Document discusses each checkpoint in more detail and provides examples using the Hypertext Markup Language (HTML), Cascading Style Sheets (CSS), Synchronized Multimedia Integration Language (SMIL), and the Mathematical Markup Language (MathML). The Techniques Document also includes techniques for document validation and testing, and an index of HTML elements and attributes (and which techniques use them).
The Web Content Accessibility Guidelines 2.0 were introduced by WAI in 2008; the main objective of these guidelines is to cover a wide range of recommendations and also to make websites more accessible and usable for all types of users, including those with “blindness and low vision, deafness and hearing loss, learning disabilities, cognitive limitations, limited movement, speech disabilities, photosensitivity and combinations of these” (World Wide Web Consortium, 2008, para.1). These guidelines have been improved from WCAG 1.0; however, for updating websites and new content, the W3C recommends using WCAG 2.0. Moreover, there are four main principles that these guidelines use: Perceivable, Operable, Understandable and Robust. Under each principle, further guidelines are offered (World Wide Web Consortium, 2008). There are 12 guidelines that assist authors of web content to make websites accessible to users with disabilities; these guidelines have 3 different levels of priority: A, AA, and AAA. Level A sets the minimum requirement, while level AAA gives the maximum requirement that websites need to meet in order to reach WCAG 2.0 (World Wide Web Consortium, 2008).

There is a significant improvement in WCAG version 2.0, and one of the main differences between WCAG versions 1.0 and 2.0 is that the structure of the levels, which in WCAG 1.0 are called priority 1, priority 2 and priority 3, are called A, AA and AAA in WCAG 2.0. In addition, the main point of WCAG 2.0 is that it can be applied and used more widely in diverse web technologies, as well as advanced technologies (W3C, 2009).

Furthermore, the crucial aspect of WCAG 2.0 is that several examples and materials have been included to make the guidelines more understandable and easier to use. However, most of the examples in WCAG 1.0 are for HTML content, and there is also a basic checklist (W3, 2009). WCAG 2.0 has more in-depth examples of techniques for ARIA, scripting, HTML/XHTML,
multimedia, and CSS to meet the guideline requirements (W3C, 2009; Armfield, 2009; Rømen & Svanæs, 2012). It shows how to avoid the common problems of web accessibility in order to help web designers and developers achieve WCAG 2.0 (Rømen & Svanæs, 2012; W3, 2009; Armfield, 2009).

Rømen and Svanæs stated:

The four general principles of accessibility lay the foundation necessary for anyone to access and use Web content. WCAG 2.0 states that anyone who wants to use the Web must have content that is perceivable, operable, understandable and robust. If any of these are not true, users with disabilities will not be able to use the Web (2012, p.376).

As a result, WCAG 2.0 contains a significant improvement that helps web auditors, developers and web designers to evaluate and broadly review web technologies, such as the scripting, ARIA and multimedia involved with websites. In addition, WCAG 2.0 not only helps improve website accessibility, but also covers a wide range of disabilities, such as vision impairment, hearing impairment and motor disabilities, which aids in maximising the benefit of web accessibility to people with disabilities.

Table 2-1 is shown below, as cited from the Accessibility Evaluation of Dubai e-Government Websites: Findings and Implications journal article. The table and figure 2-2 explain the conformance level and checklist used to evaluate web accessibility for e-government in Dubai. There are three levels: WAI-A, which is basic accessibility and means that the website must only meet the minimum requirement from W3C. The next level is WAI-AA, called “Intermediate accessibility”, which means that the basic requirements must be met and major barriers must be eliminated. The last level is WAI-AAA or “High accessibility”, meaning that all three checkpoints must be met.
### Table 2-1: WAI conformance claims (Al Mourad & Kamoun, 2013, p.392)

<table>
<thead>
<tr>
<th>Conformance Level</th>
<th>Website Accessibility Checkpoint</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WAI-A</strong></td>
<td>All priority 1 checkpoints are met. This is the minimum (basic) W3C requirement. Otherwise, one or more groups of people will find it impossible to access information from the website. This is the minimum requirement and <strong>must</strong> be met.</td>
</tr>
<tr>
<td><em>(basic accessibility)</em></td>
<td></td>
</tr>
<tr>
<td><strong>WAI-AA</strong></td>
<td>All priority 1 and 2 checkpoints are satisfied; otherwise, one or more groups of people will find it difficult to access information from the website. This conformance level status <strong>should</strong> be met, as it will remove significant barriers to accessing website documents.</td>
</tr>
<tr>
<td><em>(intermediate accessibility)</em></td>
<td></td>
</tr>
<tr>
<td><strong>WAI-AAA</strong></td>
<td>All priority 1, 2 and 3 checkpoints are satisfied; otherwise, one or more groups of people will find it somehow difficult to access information from the website. This conformance level status <strong>may</strong> be addressed by Web developers to improve access to website documents.</td>
</tr>
<tr>
<td><em>(high accessibility)</em></td>
<td></td>
</tr>
</tbody>
</table>

![Figure 2-2: The Level of conformance (Al-Khalifa, 2012)]

**Authoring Tool Accessibility Guidelines (ATAG)** are guidelines that help developers to create accessible authoring tools, such as content management systems (CMS) and web editor tools that enable users with disabilities to create web content or websites by using one of these
authoring tools (Henry, 2013). These guidelines are for the developers of various authoring tools, such as HTML editor, what-you-see-is-what-you-get (WYSIWYG), content management systems (CMS) and social networking sites (Henry, 2013). There are two different versions of ATAG, known simply as versions one and two. ATAG 1.0 was released in 2000 as a stable version and ATAG 2 is still under review. The purpose of developing ATAG 2.0 was to comply with WCAG 2.0. WAI expects to finish the final version by the end of 2014 (Henry, 2013). There are two main parts in ATAG 2.0; Part A is to “Make the authoring tool’s user interface accessible” and Part B is to “Support the production of accessible content” (Henry, 2013; Mediaaccess, 2012). In addition, most accessibility conformance is measured against WCAG 2.0, rather than ATAG, as ATAG is more of a built-in technology that, when applied correctly, should lead to WCAG 2.0 relevant outcomes.

In discussing accessibility outcomes, Harper and Chen (2012, p.84) argued that:

> We can see that technical conformance is indeed the fastest method for take up of new Web technologies, but optional aspects such as guidelines have a very low take up unless there becomes a technical rationale for their introduction. Lobbying, evangelising, and even legal means do not seem to have influenced guidelines adoption and so until something major changes, there still seems to be little reason for technologist to adopt them. In this case, we believe that a better way of encouraging conformance is to make guidelines part of the technical specification where possible.

The article demonstrated that even though there are guidelines to assist web designers and authors in making accessible websites, most websites have barriers to web accessibility that lead to difficulties of access for users with disabilities (Harper & Chen, 2012). Lopes, Gomes and Carriço (2010) illustrated that there is considerable variation between the accessibility levels of websites; few websites have met the high level requirements of accessibility.
However, the study also showed that there is a relationship between accessibility and the complexity of web pages.

Lopes et al. (2010, para.4) stated:

Several recommendations have been proposed on how Web technologies should be used without posing barriers to people with disabilities, such as WCAG, the Web Content Accessibility Guidelines. WCAG defines a set of guidelines that should be followed by developers, designers, etc. when creating Web pages, in order to ensure a good level of accessibility for all users.

However, there is another guideline that the W3 has been developing since 2005, which is Easy Checks (Henry, 2014). The aim of Easy Checks is to make the guidelines more understandable and practicable to everyone; however, websites may comply with these steps and yet still have accessibility barriers. Furthermore, W3C also recommends in-depth evaluation by using web accessibility guidelines, evaluation tools and user evaluations (Henry, 2014).

Additionally, there are other guidelines that have been developed by different countries as well, such as the US, Korea and Thailand. The United States has also developed its own guidelines, known as Section 508 (Hun Myoung, 2012); Korea has established its own web accessibility guidelines based on Section 508, WCAG 1.0 and WCAG 2.0, whilst Thailand has the Thai Web Content Accessibility Guidelines (TWCAG). Whilst nations around the world develop their own interpretation of WCAG 2.0, the ultimate goal in most cases is to create understandable implementation and testable sets of guidelines for website developers.

2.9 Assistive Technology
Assistive technology is defined as any product that improves the quality of life for people with disabilities; it comprises practical solutions that may help them in everyday activities (Borg,
Larsson & Östergren, 2011). Another study refers to assistive technology as any service or tool that makes it easy for elderly people or those with disabilities to carry out the activities that they usually do in their daily lives (Encarnação, Azevedo, Gelderblom, Newell, Mathiassen & Ebrary, 2013). The objective of assistive technology is to enhance people with disabilities potential and enrich their abilities (Scherer & Glueckauf, 2005). Moreover, many people believe that assistive technology is only a tool to help people with disabilities, but its importance goes far beyond that. Similarly, this technology goes beyond the borders of simply providing help; it opens broader prospects for lifestyles and opens new avenues of hope for a better life (Borg, Larsson & Östergren, 2011). There are numerous perceptions about what this technology can offer people with disabilities (Scherer & Glueckauf, 2005). There are various benefits to be gained for people with disabilities by using assistive technology, such as an increase in their ability to communicate, ease of integration into the community, education, reading, ease of movement, entertainment and ease of use of computers (Alper & Raharinirina, 2006; Scherer & Glueckauf, 2005). Additionally, there are a variety of people with disabilities who could benefit from assistive technology, including the following (Cook & Polgar, 2014):

- Children with cerebral palsy
- People who suffer from visual problems
- People who suffer from hearing problems
- Students of different levels

The use of technology in various fields leads to the simplification of daily tasks for people and, within that, the use of technology in the lives of the disabled leads to facilitating effects; disabled people can meet a lot of their own needs with minimal effort and less trouble, and often at a low cost (AHC, 2010; Cook & Polgar, 2014). Technology has to provide a lot of assistance to people with disabilities, and in this area, the following points summarise the
most important positive effects of technology in the daily lives of people with disabilities (AHC, 2010):

1- Develop skills to help them become independent in their working lives.

2 - Improved ability to communicate.

3 - Improved ability to travel.

4 - Increased employment opportunities

5 - Development of skills to maintain the integrity of their mental health, and medical-related improvement measures to control disease.

New applications are also being developed in the areas of education, training and rehabilitation services and employment, as well as innovations with computers and electronic devices to improve the ability to make connections, which helps disabled people to achieve self-reliance and facilitates their integration into the daily life of the society around them, regardless of the nature and degree of their disability (Cook & Polgar, 2014). Assistive technology can help in cutting down the costs of care for older people and people with disabilities, along with their families (Neelankavil, 2015).

2.10 Types of Assistive Technology
The development of assistive technology products assists people with disabilities, such as physical impairment and cognitive problems, and allows them to access and utilise various technologies. Undeniably, choosing the right products that are compatible with the operating systems, applications and support programs is vital (Hersh, Johnson, Keating & Ebrary, 2010; Abou-Zahra, 2012; Microsoft, 2014; Cook & Polgar, 2014).

- **Alternative input devices** – these are normal computer devices, such as keyboards and pointers, which are modified to suit individual users, especially people with physical disabilities.
• **Alternative keyboards** – the keypad could be larger or smaller than the standard. Also, it could be equipped with alternative key configurations and functions, and may allow users with physical disabilities to operate it with one hand.

• **Electronic pointing** – without using one’s hands, this device can be operated by ultrasound, infrared beams, eye movements, nerve signals and brain waves to move the cursors or select applications. This kind of tool supports people with motor disabilities.

• **Sip and puff systems** – these can be initiated through breathing by inhaling or exhaling and support people with physical disabilities.

• **Wands and sticks** – a strap that links from the head and mouth down to the chin can be used to press a keyboard. This is one of the tools for helping people with motor disabilities to use technology.

• **Joysticks** – these use parts of the body, such as the hands, feet and chin, to control and select items on monitors.

• **Trackballs** – these use moving balls to control the cursor and select items on monitors.

• **Touch screens** – by touching the screen provided, it is convenient and easy for individuals to access and select items on the screen.

• **Screen enlarger or magnifier** – helps to enlarge items, templates and fonts on the screen; they are also equipped with zoom functions for individuals to see the screen better. Furthermore, this type of assistive technology aims to help people with visual disabilities to interact with the Web.

• **Screen readers** – provide maximum convenience, especially for blind computer users, as a computerised voice speaks to interact and interface with the users and help people with cognitive disabilities to use technology.
According to Conway, “Even if automated tools are used, evaluators need to use more than a single tool for result validation. If evaluators intend to use screen readers or non-visual web browsers, it is necessary for them to understand how users with visual disabilities navigate using assistive technology” (2014b, p.44).

Assistive technologies are alternative tools that help to improve effectiveness and assist people with disabilities in utilising technologies, such as computers and websites. These tools enhance the ability of people with disabilities to keep up to date with the digital world and to interact with websites in the same way as non-disabled people. In addition, assistive technology goes hand in hand with WCAG 2.0, as accessible techniques provide something for the assistive technologies to ‘hook onto’ so that users can interact with the web.

2.11 Assessment Methodologies
Numerous web developers are including web accessibility tools in the website development process. The tools assist in evaluating the website to determine whether it meets the requirements of accessibility standards, as well as searching for potential issues; moreover, it is done in order to maximise the accessibility for different target users and to suit their needs. Understanding the standards of web accessibility is significantly improved, depending on the tools (WebAIM, 2012).

Evaluation is an important technique that assists a variety of people, such as content authors, designers, developers and others, to assess the accessibility of the websites. The approach for the evaluation of websites includes several steps that need to be followed in order to pass WCAG 2.0 (Velleman & Abou-Zahra, 2014). The purpose of these assessments is to evaluate the scope of the problems of accessibility and to provide recommendations on how to redesign websites to meet the requirements of web accessibility guidelines, including either
ATAG 2.0 or WCAG 2.0 (Velleman & Abou-Zahra, 2014). However, this literature will focus on automated tools, manual experts and user testing.

Pereira, Ferreira & Archambault (2015, p.78) stated:

Many websites and softwares have accessibility barriers that hinder or preclude its use by many users. These barriers can be caused by the inadequate construction of the pages, leading to poor and hard understand interaction. People with total visual impairment access websites through assistive technologies - screen readers but in order to work fairly well, these pages must be in accordance with accessibility guidelines [6]. To find out if a page is in conformance with the guidelines, it is necessary that its accessibility be evaluated according some method. According to WAI, the recommendations for the evaluation of accessibility in websites incorporate different approaches, which are explained below (Velleman & Abou-Zahra, 2014):

- **Easy Checks - A First Review of Web Accessibility**
  The idea of this approach is to provide an overall review of the websites and check for obvious accessibility problems.

- **Involving Users in Web Accessibility Evaluation**
  The aim of having people with disabilities test the websites is to discover major accessibility issues that cannot be identified simply through web expertise.

- **Selecting Web Accessibility Evaluation Tools**
  This approach assists experts in checking entire websites by using automated tools and also identifying accessibility errors for further review or manual tests.

- **Using Combined Expertise to Evaluate Web Accessibility**
  The goal of this approach is to involve more experts with different skills to identify all accessibility errors.

Some of these methods are optional, such as involving users, combined expertise and evolution tools, whereas others require experts (Velleman & Abou-Zahra, 2014).
Vivienne Conway (2014, para.5) stated:

Web Accessibility Conformance Evaluation Methodology (WCAG-EM) is a harmonised approach that has been vetted by the WCAG Working Group and has been developed through the W3C process. It provides evaluators and website owners with a methodology to describe how a website has been evaluated. It provides a means to assess a whole website whereas the WCAG 2.0 Conformance Requirements relate only to individual pages. With WCAG-EM, there is the means to assess the level of conformance with WCAG 2.0 with reasonable confidence. This methodology is applicable independent of the size of the website, the technology used to create the website, the tools used to evaluate the website, the web browser used, and any assistive technology and software used by the user.

2.12 Evaluation Procedure:
Figure 2-3: The diagram below illustrates the steps and the connections between those steps when evaluating websites. There are a total of five steps and each step is relevant to the others. Each successive activity can return to the previous steps depending on newly discovered information during the evaluation process (Velleman & Abou-Zahra, 2014, para.35).

![Diagram of Evaluation Steps](image)

2.13 Human Testing
The evaluation of web accessibility through manual testing requires knowledge to ensure reliability and enhance maximum accuracy. One of the advantages of manual testing is that it can find violations and usability issues that automated tools cannot, but it is far slower, allows
less coverage, is expensive and is reliant on the testers’ understanding of Web Content Accessibility Guidelines (WCAG 2.0) and web technologies (Velleman & Abou-Zahra, 2014).

The W3C/WAI stated:

> Effective evaluation of Web accessibility requires more than simply running an evaluation tool on a Web site. Comprehensive and effective evaluations require evaluators with an understanding of Web technologies, evaluation tools, barriers that people with disabilities experience, assistive technologies and approaches that people with disabilities use, and accessibility guidelines and techniques (2002, para.2).

The W3C evaluation plays a vital role in evaluating the accessibility of web content. The quality of revision requires great knowledge, experience, and training, and most importantly, collaboration between testers and users could maximise the accuracy of the results (Australian Government, 2010b).

2.14 Automated Accessibility Testing

This is a software program or an online service that reviews the level of accessibility for a website by utilising a variety of tools. Using Automated Accessibility testing helps to minimise time and appears to be less complicated (McLellan, 2011). There is considerable potential for the tools to support the testers in many kinds of review, such as the automated identification of the standard of the website and the level of accessibility; moreover, the reporting of the accessibility performance of the website can also be undertaken (Abou-Zahra, 2005).

There are a variety of web accessibility tools that are used for evaluation, depending on the size and scope of the websites. Some tools are more user-friendly, some are complicated, and some allow for appraising one page at a time. Some provide only a quick scan and minimal evaluation, whereas others offer a greater focus on detail and are able to review even a large website with multiple pages (Abou-Zahra, 2005).
After evaluation, most quality tools can provide automated generation of the report and can detect errors, such as missing text descriptions. Also, the report should provide solutions and advice that the website may need for further manual testing. Furthermore, the report should offer different templates and styles based on the website’s target users in order to maximise the benefits and apply the appropriate tools to suit the target users (WebAIM, 2013).

According to AKGÜL and Vatansever:

Web accessibility evaluation tools are software programs or online services that are used to check your website’s accessibility level under web accessibility guidelines. There is a huge number of accessibility tools for commercial purposes or freely available on the Web (2016, pg.203).

Indeed, automated testing saves both time and labour, but the human testing process offers greater accuracy (WebAIM, 2013). According to Vigo, Brown and Conway (2013), there are 3 categories of outcome when evaluating websites. Firstly, true positives are real issues discovered by the tools (Vigo, Brown & Conway, 2013). Secondly, false positives are any mistakes reported by the tools, but when using human judgement, no issues occur (Vigo, Brown & Conway, 2013; Brajnik, 2004). Lastly, false negatives are defined as issues that cannot be detected by the tools (Vigo, Brown & Conway, 2013; Brajnik, 2004). It is inevitable that the results of automated testing could be inaccurate or unclear. It is worth noting that the tools only evaluate the accessibility of the website, rather than its general performance. For that reason, many studies indicate that a combination method of human testing and automated tools is preferable for a better result (Vigo, Brown & Conway, 2013; Salomoni, Mirri, Muratori & Battistelli, 2012).
2.15  Disability law:
2.15.1  US Law:
Section 508 of United States law outlines the requirements for any electronic information material or information technology system that is built, maintained, purchased or utilised by the Federal government to be usable by people with disabilities. Specifically, the Americans with Disabilities Act was established to prohibit discrimination based on disability in terms of employment, commercial facilities and telecommunications industries, amongst others. Federal electronic and information technology is supposed to be accessible to people living with disabilities, which includes employees and the public.

An accessible system refers to one that can be run in numerous ways and does not limit the user’s ability or senses. For instance, if a system only offers output in a visual form, it may not be accessible to people who are visually impaired. Similarly, a system that offers output only in audio form is likely to limit people who are deaf or cannot hear properly. Some people with disabilities may require accessibility-related software or devices in order to utilise systems that meet the requirements of Section 508 (U.S. Department of Justice, 2009).

2.15.2  Australia Law
According to the Australian Disability Discrimination Act 1992, it is unlawful for people who provide goods and services, or for those who make facilities accessible, to discriminate against other people due to their disability (Australian Government, 2015). For example, the Act states that a person discriminates against another person based on their disability by treating or trying to treat the other person in a less favourable manner than the discriminator would treat someone else without the disability. According to the law, “The requirement for Australian Government departments and agencies to provide accessible information and online services has been a component of each e-Government Strategy since 2000” (Australian Government, 2010, p.6).
According to the Australian Disability Services Act 1986, it is unlawful for providers of goods and services, or for people who make facilities accessible, whether or not they are being paid, to discriminate against people with disabilities (Australian Government, 2013). This law is meant to substitute provisions of the *Handicapped Persons Assistance Act 1974*, and the *Social Security Act 1947* with provisions that suppliers are responsive to the needs of persons with disabilities. The Act aims to eliminate discrimination by recognising that the rights and freedoms of people with disabilities are exercised and by supporting them to advocate for themselves in such matters.

2.15.3 UK Law

The Equality Act 2010 signifies the end result of years of discussion on how the British equality law can be improved. It affords people higher levels of protection against discrimination and offers employers and businesses more clarity regarding their responsibilities. Moreover, the law “sets a new expectation that public services must treat everyone with dignity and respect” (UK Government, n.d., p.13).

The UK law concerning disabled people talks about the duty to make reasonable adjustments for people with disabilities in terms of services to the public, as well as the public functions and unions. One type of discrimination against people with disabilities takes place when a service provider fails to comply with their duty to make the reasonable adjustments required of them in relation to that disabled person (UK Government, n.d., p. 102). According to the Act, service providers are expected to take the necessary measures in order to provide auxiliary aids or services. As well as implying a requirement to make adjustments to the physical built environment or providing a mobility aide, it also requires that the provider ensures that information is offered in an accessible format. According to the Act, “any
alternative method of making services available must be a ‘reasonable’ one” (UK Government, n.d., p. 121).

2.15.4 United Nations
The principles of the present convention are non-discrimination, full participation in society, equal opportunities, accessibility and gender equality. States Parties undertake to promote the full realisation of human rights and freedoms for each person with disabilities without discriminating against them due to their disability (UN, 2015). Hereby, States Parties undertake to implement all suitable legislative, administrative and other approaches for the execution of the rights acknowledged in the current Convention. States Parties acknowledge that every person is equal and has a right to equal protection without being discriminated against. In order to ensure that equality is upheld and discrimination abolished, States Parties shall take the appropriate measures to ensure that rational accommodation is offered. States Parties shall also ensure that awareness is raised in the society regarding people with disabilities (UN, 2015).

2.16 Accessibility Policy
2.16.1 Relevance of Web Accessibility Policies
The problem of the ‘digital divide’ potentially affecting those strata of the population who, for various reasons, would be unable to make full use of standardised Internet access procedures has been widely discussed in both the popular press and academic publications. For the purposes of this study, the discussion will focus on the historical development of web accessibility policies that have been designed to tackle this problem. In particular, the main focus of this literature review will be aimed at the development of web accessibility policies in major English-speaking nation-states, including the United Kingdom, the United States, Australia and Canada. In doing so, a more comprehensive account of the issues that need to be dealt with by policy makers and researchers alike may be developed. Furthermore, the
connections between contemporary models of e-government and web accessibility policies will be presented and explained in order to present a far-reaching perspective on the matter. Still, these design and development-related guidelines tell us almost nothing about the appropriate institutional arrangements that should be implemented in order to guarantee equitable access to web resources for disabled people. Therefore, a short review of the policies instituted to that effect in the abovementioned nation-states is required here.

2.16.2 The U.S. Accessibility Policies
In the United States, the development of a legal framework adapted for the needs and concerns of disabled persons with respect to web accessibility effectively began in the 1990s, with the promulgation of several crucial Federal statutes focused on that problem. To begin with, the 1990 Americans with Disabilities Act (ADA) explicitly prohibited discrimination and guaranteed equal opportunities “for persons with disabilities in employment, state, and local government services, public accommodations, commercial facilities, and transportation” (Becker, 2008, p. 145). As it turned out, the ADA’s main provisions have been successfully used in several lawsuits against some commercial websites accused of failing to ensure the accessibility of their resources to disabled users (Becker, 2008; Parmanto & Hackett, 2011). In a similar vein, Section 255 of the 1996 Telecommunications Act directly provided for the need to ensure that all electronic equipment and telecommunications services must be accessible to persons with disabilities (Prieger, 1998). Finally, the 1998 Assistive Act dealt with the development and implementation of far-reaching Federal funds-based grant programmes, directly administered by the U.S. Department of Education, which had as its objective the provision of assistive technologies to disabled individuals via local and state authorities. Altogether, these acts and regulations appear to project an extension of Section 504 of the Rehabilitation Act of 1973, which originally stipulated that all “entities receiving
federal financial assistance” should be required to adhere to specific guidelines of non-discriminative and inclusive accessibility policies (Hill, 2011, p. 479-80). Finally, the 2010 directive adopted by the U.S. Department of Justice explicitly presented “accessible electronic and information technology” as an “auxiliary aid” provided under the premises of ADA, which would make such aid effectively mandatory to “public accommodations and public entities.” In turn, this would include the provision of both electronic equipment and material environments, such as the design of public kiosks/cubicles and other furniture (Hill, 2011, p. 480).

2.16.3 Web Accessibility in the UK
The development of modern standards of Web accessibility to disabled users in the United Kingdom was launched in 1995 with the adoption of the UK Disability Discrimination Act of 1995 (DDA), and continued into the 2000s, culminating in respective clauses of the Equality Act 2010 (Equality and Human Rights Commission, 2014; Easton, 2012). Furthermore, in 2010, the first explicit standard for website designers concerning the issues of web accessibility was put into practise with the issuance of the BS 8878 standard regulation (Equality and Human Rights Commission, 2014; Sánchez-Gordón & Moreno, 2014). Similarly, the 2006 PAS 78 publication, jointly authored by the UK Disability Rights Commission and the British Standards Institution, presented important guidelines for website designers and public and private entities using their services with a view to adapting existing practises of website design and maintenance to the demands of W3C and ECMA Standards with respect to web accessibility (Equality and Human Rights Commission, 2014).

2.16.4 Australia and Web Accessibility
In the case of Australia, the key web accessibility guidelines are enforced in accordance with the provisions of the 1992 Disability Discrimination Act, with amendments presented in the 2010 Advisory Notes, which were added to the Act (Australian Human Rights Commission,
2014; Sloan & Horton, 2014). It appears as though the primary emphasis in these regulations was focused on the provision of equal access to websites and other web resources via the attainment of WCAG 2.0 guidelines on graphics and text accessibility, as well as the use of proper standardised features in the context of dealing with Portable Document Format (PDF) documents (Australian Human Rights Commission, 2010). As in the previous cases, the Australian web accessibility legislation asserts the universality of a right to equal access, falling in line with the established international practise. In June 2010, a comprehensive Web Accessibility National Transition Strategy was presented by the Australian Government, which was intended to provide an operational plan for the development and implementation of an all-out transition of governmental agencies’ online resources to conform to the requirements of WCAG 2.0 standards (Australian Government, 2010). Furthermore, as noted by Lohman (2014), several state governments have similarly endeavoured to develop specific web accessibility-related legal frameworks of their own; for example, New South Wales, Victoria and Western Australia have committed their websites to becoming compliant with WCAG 2.0 at Level A/AA, while the Northern Territory and the ACT Government are currently implementing this standard in their e-government practises (Lohman, 2014).

2.16.5 Canada and Web Accessibility Practises
The Canadian Government has consistently worked to adapt to the WCAG 2.0 guidelines of Web accessibility, as represented by the 2011 Standard on Web Accessibility, amended as of March 2013 (Treasury Board of Canada Secretariat, 2014). In turn, the key regulations of this Standard are derived from appropriate provisions of both the Canadian Charter of Rights and Freedoms and the Canadian Human Rights Act (CIPPIC, 2012). This signifies an intrinsic connection between Canadian human rights and web accessibility legislation.
2.17 E-government and Web Accessibility

2.17.1 Legal Requirements and Web Accessibility for Governmental Websites

The most common definition of e-government that may be pertinent to the context of this research is “the use of information and communication technologies in public administration to improve the relationship between the citizens and businesses and the public sector through enhanced, cost-effective and efficient delivery of services, information and knowledge” (Farahani, Asgari & Davarzani, 2009, p.287). The main benefits potentially accrued as a result of the widespread implementation of e-government practices may include overall positive changes in terms of the speed of delivery, the facility of use of appropriate administrative services, greater perception of personalisation and control, and time-saving (Weerakkody et al., 2013, p.9). Furthermore, disadvantaged users may benefit from the wider introduction of e-government practices, as streamlining may result in the lowering of extant levels of the digital divide, which is currently one of the major features of both developing and affluent developed societies (Helbig et al., 2009; Hacker & Morgan, 2011).

The empirical studies proceeding from the context of certain Western societies may lead one to surmise that the growth in e-government would satisfy its users’ expectations. For instance, the survey carried out by Dutton et al. (2009) showed that 59% of UK users surveyed had used a government-related website, as opposed to 47% in 2007. A similar survey produced in 2005 found that more than 90% of the respondents rated British e-government services as ‘very good’ (Pilling, 2010, p.203). Similarly, in the case of the U.S., 66% of total users were reported to have visited at least a single Federal government website in 2007 (Estabrook et al., 2007). At the same time, substantial problems with access rates for disabled users have been reported for both of these nations. Therefore, it may be useful to examine some of the legal requirements enforced in both the U.S. and the United Kingdom with respect to the web accessibility of their e-government sites.
2.17.2 UK E-government Practises
The practice of web accessibility by UK e-government websites is illustrated by the number of resources devoted by the government and activities that test accessibility features by front-end developers to ensure the standard of accessibility among UK e-government websites and achieve the aim of not excluding any users with a disability (Marshall, 2012).

In the United Kingdom, the accessibility guidelines enforced for e-government websites appear to follow the provisions of the DDA, as stipulated in its Part III (legislation, 1995). As the disability equality duty envisaged by this Act requires service providers to follow a proactive approach in implementing disability equality guidelines, one may assume that the UK public bodies are obliged to follow this demand in setting up and regulating the designs of their websites. At the practical level, the United Kingdom’s governmental websites are required to follow the WCAG 2.0 guidelines, as presented by WSC in December 2008 (Kuzma, 2009). Given that these guidelines outline three priority levels reflecting different degrees of commitment to providing equitable access to the web resources in question, one may conclude that, in general, UK e-government practises are likely to follow these standards for each relevant policy context.

2.17.3 U.S. E-government Practises
The design and strategy of US e-government practises is to target four different groups: “Government to Citizen (G2C)”, “Government to Business (G2B)”, “Government to Government (G2G)”, and “Internal Efficiency and Effectiveness (IEE)” (Mathews, 2010). In addition, around 25% of US e-government websites are accessible by people with disabilities (Mathews, 2010). According to Mathews, "While the Office of Information made a lot of progress in making services more accessible to citizens between 2002-2008, there are still issues that remain" (2010, p.6). The U.S. practises of ensuring the accessibility of e-government websites tend to follow the specific amendment to the Rehabilitation Act of
1973, known as Section 508 (Hill, 2011). The latter provides for specific requirements to be followed with regard to the electronic technologies used by federal agencies, with a clear focus on their accessibility to “employees and members of the public with disabilities” (Pilling, 2010, p.207). As presented by Thatcher (2010), the Access Board is a specialised federal agency dealing with the oversight of fulfilment of such guidelines and has developed more than 16 specific web standards aimed at achieving the goal of the widest possible accessibility. Section 508 particular guidelines developed within these standards largely correlate with the respective WCAG 1.0 priority guidelines (Thatcher, 2010). Hence, one may conclude that the U.S. system of ensuring web accessibility is both less advanced than the British one and more detailed in its specific regulations.

2.17.4 Australian Practises
As for the Australian government, its attitude regarding the need for adopting a comprehensive approach towards web accessibility standards is best exemplified by the government-directed implementation of WCAG 2.0 accessibility guidelines for all e-government-related websites since November 2009 (Australian government, 2014). According to Conway, “The Australian Government has developed a unique response to the international adoption of website accessibility standards” (2014b, p.47). Furthermore, in December 2012, further steps in this direction were taken with the promulgation of the additional requirement of the Financial Management and Accountability Act 1997 (FMA Act), stipulating that all web resources serving the needs of the Australian government should transition to the WCAG 2.0 Level AA standard by December 2014 (Australian government, 2014). Hence, the need to conform to internationally valid standards of web accessibility was once again affirmed by the Australian government’s policy intentions. Conway stated: “Australia ranked in the top 10 countries for e-government ratings, coming in eighth place in
2007, improving from twelfth in 2006. Australia ranked more highly in the accessibility features, scoring better than Great Britain” (2014b, p.28).

2.17.5 E-government Websites and Assessment:
Nowadays, the subject of e-government website assessment is found to be widespread among researchers and developers.

Kuzma (2009, p.89) stated:

A combination of legal and technical methods should be combined to achieve a higher level of compliance. To facilitate this, government need to not only implement laws, but must find ways to ensure compliance with their mandates and impose sanctions if they are not met. Web administrators also play a critical role in ensuring their sites adhere to government laws and industry standards.

The article ‘Regulatory Compliance and Web Accessibility of UK Parliament Sites’ showed that countries with solid disability legislation had more accessible websites than others (Kuzma, 2009). The study also examined the accessibility of e-government websites in European, Asian and African countries (Kuzma, 2009).

Kuzma (2010) examined the accessibility of e-government websites of 12 developing and developed countries; the research identified numerous accessibility issues in global government websites, such as lack of alternative text, which is simple for website developers to fix.

The work by Kuzma (2010), Global E-government Web Accessibility: A Case Study. The table presents an automated evaluation of e-government websites against web accessibility guidelines. The study showed that most global e-government websites do not comply with WCAG. In addition, the study addressed the fact that the number of basic accessibility errors in most websites is high.
Kamoun, Al Mourad and Bataineh (2013) concluded that web accessibility guidelines (WCAG 1) are used by most e-government websites, even though WCAG 2 was released and recommended by W3C/WAI. There are many reasons why most e-government websites have not complied with WCAG 1.0. One of the main factors is that there is a lack of understanding of web accessibility guidelines and how to use them; the second factor could be language barriers. According to our review, most e-government websites in countries such as Australia, the UK and the USA are aware of this and have progressed to WCAG 2.

2.18 Middle East Disability and Accessibility
2.18.1 Accessibility in the Middle East:
While there is a significant amount of academic and commercial research being done on web accessibility around the world, particularly in North America and Europe, only a small amount of work has focused on the Middle East.

In the Middle East, there is a perceived lack of disability services, which can have a significant impact on the lifestyle of people with disabilities (Al-Hilawani, 2008). For example, in Kuwait, the society is the most significant part of the culture, meaning that people like to engage their lifestyle with their traditional culture (Al-Hilawani, 2008). Moreover, people with physical disabilities have limited access to transport in Qatar, so they are restricted in terms of independence when they want to go out (Zetterström, 2012). Figure 2-4, shown below, demonstrates the lifestyles of people with disabilities in Qatar.
However, in some parts of Kuwaiti society, people with disabilities are labelled and treated as outcasts from their community. Furthermore, one of the major difficulties that people with disabilities encounter is limited access to education services in public schools (Al-Hilawani, 2008). Without government action or intervention, disability services and the social inclusion of people with special needs cannot be advanced or meet requirements.

2.18.2 Middle East and Technologies

The number of Internet users in the Middle East has increased dramatically in recent years (Gulf Daily News, 2008). According to a Gulf business article, the number of web users in the Gulf region has risen 1,648.2% between 2000 and 2009 (Gulf Daily News, 2008). This indicates the strong presence of the Internet in Middle Eastern society, and the need for all citizens within the region to have equal access to web resources. For example, the number of people who access the Internet in the UAE is up to 70% of the population compared to other Middle East countries (Kamoun & Al Mourad, 2014).

The general governmental policy in the Middle East has been to control the connection between users and cyberspace (Gulf Business, 2011). For example, Internet users in the United Arab Emirates had no access to Twitter until the government decided to unblock it in late 2010 (Gulf Business, 2011). Recently, Internet users in the Middle East have increased...
their utilisation of online services and activities, such as online banking, e-government and online shopping (Kuwait telecommunications, 2012).

2.18.3 Web Accessibility in the Middle East: Research has been undertaken in an attempt to comprehend whether e-government should take further steps to reassess their websites and ensure that they comply with the latest WCAG 2. The study showed the various results obtained from testing Dubai’s e-government websites (Kamoun, Al Mourad & Bataineh, 2013). The table below has been copied from Kamoun, Al Mourad and Bataineh’s (2013) article. Table 2-2 illustrates the accessibility conformance results of Dubai’s e-government websites.

Table 2-2: WCAG 1.0 & WCAG 2.0 accessibility conformance results (Kamoun, Al Mourad & Bataineh, 2013, p.396).

<table>
<thead>
<tr>
<th>Dubai e-Government Website</th>
<th>WCAG 1 Level A errors</th>
<th>WCAG 2 Level A errors</th>
<th>WCAG 1 Level AA errors</th>
<th>WCAG 2 Level AA errors</th>
<th>WCAG 1 Level AAA errors</th>
<th>WCAG 2 Level AAA error</th>
</tr>
</thead>
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<tr>
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<td>153</td>
<td>38</td>
<td>50</td>
<td>76</td>
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<tr>
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<td>246</td>
<td>137</td>
<td>54</td>
<td>243</td>
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<tr>
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<td>556</td>
<td>141</td>
<td>45</td>
<td>50</td>
<td>192</td>
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<td>48</td>
<td>6</td>
<td>35</td>
<td>32</td>
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<td>105</td>
<td>1</td>
<td>276</td>
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<td>33</td>
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<td>180</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>18</td>
</tr>
<tr>
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<td>557</td>
</tr>
<tr>
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<td>0</td>
<td>126</td>
<td>17</td>
<td>2</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>DNRD</td>
<td>64</td>
<td>892</td>
<td>731</td>
<td>4</td>
<td>85</td>
<td>2</td>
</tr>
<tr>
<td>DHA</td>
<td>46</td>
<td>372</td>
<td>61</td>
<td>2</td>
<td>135</td>
<td>25</td>
</tr>
</tbody>
</table>
According to Al-Khalifa (2012), current web accessibility adherence in Saudi Arabia regarding web accessibility is poorly implemented and the subject appears to have gone largely unnoticed (Al-Khalifa, 2012). For example, none of the e-government websites in Saudi Arabia have passed WCAG 2.0 accessibility guidelines at any level, nor do they make reference to the guidelines in any way (Al-Khalifa, 2012). This result is similar to that reported by Al Mourad and Kamoun, who concurred that none of the Dubai e-government websites have passed WCAG 1.0 at any level. Moreover, the study showed that all of the reviews of these websites had been done using automated testing tools (Al Mourad & Kamoun, 2013). Kamoun and Al Mourad (2014) confirmed that no Dubai e-government website has passed WCAG 2.0 at any level. Other research done by Abanumy, Al-Badi and Mayhew (2005) showed that the Oman and Saudi Arabian e-government websites did not comply with web accessibility guidelines (WCAG). Similar results were found by Al-Radaideh, Nuser and Wahbeh (2011); their article evaluated the e-government websites of Jordan and found that most Jordanian e-government websites did not pass WCAG 1.0. Overall, these results illustrate that most e-government websites in the Middle East have not passed either WCAG 1.0 or 2.0 at any level.

Zetterström (2012) addressed the barriers of accessibility in Qatar. In general, people with disabilities in Qatar are aware of assistive technology, but the usage of such assistive
technology is below the normal rate, even though the assistive technology is free for Qatar’s citizens. This is likely due to a lack of awareness (Zetterström, 2012).

Awan (2003, p.503) stated:

It is recommended that all GCC countries improve website organization and structure, post all means of contact information i.e. phone, address, and Email contact information, and finally, increase website accessibility. Such study is planned for every year to monitor progress of E-government in the region.

According to the web accessibility analysis of the USA’s e-government websites by Goodwin (2011), the effectiveness of web accessibility in developed countries is more advanced and superior to that of developing countries.

Al-Khalifa et al. (2011) showed that automated evaluation tools have certain issues regarding language, including Arabic; the article also demonstrated several types of issues that the evaluator faces when using these tools to assess Arabic websites. The research also showed that some of these tools presented false reports and made errors when assessing Arabic websites; for that reason, these tools cannot be relied upon to test the accessibility of Arabic websites (Al-Khalifa et al., 2011).

The Qatar Assistive Technology Centre is also known as Mada. Mada is a non-profit organisation committed to connecting people with disabilities to ICT as a means of enhancing and enriching their abilities (Mada, 2014). People with disabilities who visit the centre can interact with a variety of assistive technology forms that enable them to engage with the world of information and communication technology. The centre’s activities include organising training courses for people with disabilities and their parents and caregivers, performing individual assessments to determine the needs of people with disabilities, and using technology to help integrate them into society in a real and tangible way (Mada, 2014).
The centre works with web developers and producers of digital content platforms to create
digital access and abide by the rules; the centre also works with the resulting technology
companies to help develop solutions in Arabic. Mada was created under the supervision of
the Supreme Council of Telecommunication and Information Technology in the year 2010
(Mada, 2014). Moreover, Mada has a group of people who are able to test and ensure the
quality and ease of use of copies of Arabic technology assistance programs. Furthermore, a
great deal of research has been carried out, such as on permeability barriers in Qatar. The
research found that the lack of awareness of technology assistance is one of the biggest
obstacles, and in particular, some groups still face challenges in raising awareness about the
available assistance technologies and services offered by Mada in Qatar (Mada, 2012). The
centre has also built an automated tool to check and monitor the accessibility of Qatar
websites based on WCAG 2.0 (Mada, 2014).

Tashtoush, Darabseh and Al-Sarhan (2016) addressed the level of accessibility on Arabian e-
Government websites using only automated tools. The study showed that, “Egypt’s website
is the best Arabian e-government website accessibility in both English and Arabic versions.
Whereas, the worst two websites are Sudan website in Arabic version and Dubai website in

In conclusion, the tone of the literature review portrays web accessibility as an opportunity
to help people with disabilities access the World Wide Web by using available assistive
technologies, such as screen readers and alternative keyboards. Undeniably, this area seems
to have stable growth in research and awareness from multiple industries and authorities,
including governments; more so in Western nations than in the Middle East. The reason
behind this difference is a lack of research and awareness regarding this topic in the Middle
East. This thesis will seek to redress this situation by conducting a detailed study within a Middle Eastern context.
Chapter 3: Methods and Methodology

Research methodology is defined as the measurements and tools that perform significant roles in research projects. These methods and techniques were applied in this research as a guideline and direction for how the research would be implemented. Research methodology is classified as qualitative, quantitative or a mixture of both (Creswell, 2007).

Several basic types of research design are notable, with quantitative and qualitative research designs usually seen as the opposite poles of the spectrum. The proponents of qualitative research proceed from the assumptions common to post-positivist or social constructivist thinking (Creswell, 2007), using the shared perceptions of the researcher’s subjects (their ‘worlds’) as a starting point to collect and analyse data in order to generate appropriate research designs. In contrast, quantitative research advocates presume that it is the focus on and measurement of allegedly objective data from social life that garners valuable insights. However, while qualitative and quantitative research approaches are well known, the multitude of research designs is not limited to their generalised prototypes. The following information will contribute to a more precise understanding of the research design of this study, as its key features reflect the problems inherently motivating this research. The methodological process of each of the above will be discussed in depth in the following sections.

3.1 Hybrid Approach

While the advocates of purely quantitative research approaches claim that social realities should be seen in the same line as purely physical phenomena, their opponents contend that the social world is effectively comprised of multiple societal realities, making “time- and context-free generalisations” practically impossible (Johnson & Onwuegbuzie, 2004, p. 14). However, a simple exploration would enable one to determine that these extreme
perspectives are prone to lead to so-called ‘paradigm wars’, the original aims of which are effectively disregarded by both parties. Therefore, it may be possible to present a hybrid approach to serve as a bridge between ‘pure’ quantitative and qualitative approaches.

The definitions of the hybrid approach are actually rather varied. For instance, Johnson and Onwuegbuzie (2004) define the ‘mixed-method research,’ as they have chosen to call it, as a class of research, “where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study” (Johnson & Onwuegbuzie, 2004, p. 17). Similarly, Greene (2006) sees “mixed-method inquiry” as “an approach to investigating the social world that ideally involves more than one methodological tradition and thus more than one way of knowing” (2006, p. 94). Hence, hybrid designs focus on combining quantitative and qualitative research elements to attain more efficient results and inferences.

Some examples of hybrid design that are relevant to this study include those by McDonald and Hannafin (2003), Small et al. (2005), Kane et al. (2007) Conway (2011), Conway (2013) and Conway (2014). While these studies have different foci, all of them benefit from the integration of qualitative and quantitative methods. There are different evaluations, including automated tests, manual tests, surveys and interviews; as a result, there will be a great deal of information to analyse, meaning that the result of using mixed approaches will be highly accurate.

3.2 Exploratory Research
In terms of research objectives, this study followed the patterns of exploratory research, rather than merely descriptive or explanatory ones. In the most general terms, exploratory research may be defined as an approach whose main goal is to: “gain initial insights and ideas about research problems, and to identify variables associated with these problems”
(McConville & Chui, 2007, p. 50); “either to explore an area where little is known or to investigate the possibilities of undertaking a particular research study” (Kumar, 2012, p. 32); or acquire new knowledge “when little is known about a particular phenomenon” (Kelly, 2009, p. 25). Exploratory research is meant to explore the research questions and has no intention of providing final and conclusive solutions to current problems. It helps the researcher intending to tackle a problem, especially when little previous research has been conducted on the issue (Wohlin & Aurum, 2015). Thus, the purpose of exploratory studies is to facilitate the establishment of more comprehensive knowledge (e.g. the knowledge possessed by the Gulf States’ governments on web accessibility standards) by means of collecting and analysing previously overlooked data.

Examples of exploratory research from web accessibility studies include Shi (2007), Leitner and Strauss (2008), Conway (2010), Al-Khalifa (2012) and Conway (2014b). All of those studies focus on covering the phenomena that have previously been scarcely classified.

3.3 Case Study

The notion of a case study is connected with the idea of a “thorough, holistic, and in-depth examination of the aspects” of a case, which may be an individual, a group, or some other social unit (Kumar, 2012, p. 138). Similar definitions of ‘case study’ include Creswell’s (2007) concept of the “study of an issue explored through one or more cases within a bounded system” (2007, p. 73) or the exploration of a “bounded, integrated system” over a specific amount of time (Klenke, 2008). Thus, in this context, the Gulf States’ e-government websites serve as a collective case.

Therefore, in all these definitions, the purpose of a case study is defined as the examination/exploration of a particular aspect of a holistic social phenomenon. The
aforementioned studies by Shi (2007), Kane et al. (2007), Conway (2010), Al Khalifa (2012) and Conway (2014b) may be good examples of case study research.

3.4 Cross-Sectional Design
Finally, the notion of cross-sectional design may be conceptualised as a sub-type of research design focused on “finding out the prevalence of a phenomenon, situation, problem, attitude or issue, by taking a cross-section of the population” (Kumar, 2012, p. 120). Some other definitions of cross-sectional research design emphasise the need to “study some phenomenon by taking a cross-section of it at one time” (Kumar, 2014) or to compare and contrast a “number of cases” on “one occasion” (Flick, 2007, p. 45). Hence, the purpose of cross-sectional design is, as will be seen in this study, to specify the degree to which some phenomena may occur (i.e. to what level Gulf States’ e-government websites may exhibit appropriate features). With respect to web accessibility studies, typical examples of cross-sectional research design include those by Griffiths and Christensen (2000), Zeng and Parmanto (2004) and Lee et al. (2005).

The following Figure 3-1 illustrates the strategies, research design and selected methods implemented for this research. Owing to the limited research and studies carried out on web accessibility in Gulf region countries, exploratory research was applied, in addition to case studies and cross-sectional studies, to ensure maximum accuracy of information. Four instruments were used - automated and manual assessments, end user tests, interviews and surveys.

The research and all research activities only commenced after first complying with the University’s ethics policy. None of the information relevant to the study was released or discussed with the public, which includes information on all stakeholders involved in the government department and their staff involved with the e-government website.
3.5 Research Design
Bearing in mind that research as a practise is directly connected with empirical evidence and practise (Kumar, 2012), it is inevitable that all research-related activities are carried out in accordance with some practical goals and aims. Accordingly, a research design incorporates “aims, uses, purposes and plans within the practical constraints of location, time, money and availability of staff” (Hakim, 2000, p. 1).

Kumar (2012) viewed research design as an “arrangement of conditions for the collection and analysis of data in a manner that combines relevance to research with economy in procedure” (Kumar, 2012, p. 50). The second relevant aspect involved in research design consists of the fact that research design enables a researcher to guarantee that, “the procedures undertaken are adequate to obtain valid, objective and accurate answers to the research questions” (Kumar, 2012, p. 110).

When planning a research project, it is crucial to outline a research design in order to establish the project’s foundation and direction. A clear, appropriate and rational research design
allows researchers to procure accurate information in the most critical and logical manner. Research design consists of both qualitative and quantitative elements (Toledo-Pereyra, 2012). Qualitative research acquires information through surveys and face-to-face or online interviews with web developers who create and maintain e-government websites, whereas quantitative methods use automated web accessibility checking tools and manual tools to assess and evaluate government websites.

3.5.1 Website Audit
W3C has officially released its Web Accessibility Conformance Evaluation Methodology (WCAG-EM). The main goal of WCAG-EM is to assist testers in using accurate methods and steps to evaluate websites. According to Conway, WCAG-EM “can be used to assess full, self-enclosed websites—including applications and mobile websites and smaller collections of related web pages, such as the library section” (2014, para.9). By applying WCAG-EM to this research, not only is the accuracy of the outcome improved, but logical methods and processes are also provided, along with WCAG 2.0 (Velleman & Abou-Zahra, 2014; Conway, 2014). Therefore, this research study applied that Evaluation Methodology approach (WCAG-EM). Quantitative techniques were applied using an automated web accessibility checking tool to evaluate the government websites for their level of accessibility. The manual test was carried out by selecting certain web pages, such as the home page, the contact page, e-services pages, the pages with tables and those with forms, as these pages are commonly used and generate high interaction with web users, including the disabled. Both the automated and the manual checks produced reports of errors and criteria, as well as functions that meet the requirements and comply with WCAG 2.0 standards. This research only reviewed and assessed ten e-government websites in the Arabic language for each country, including Kuwait, the UAE and Qatar.
Process for automated test:

- First, select an automated tool, such as SortSite.
- Second, enter the website link into the automated tool.
- Third, the tool will check if the website meets the requirements of WCAG 2.0.
- Finally, the tool will generate a full report of errors and recommendations in order to meet the standards of WCAG 2.0.

Process for manual test:

- Create an Excel sheet with all the requirements of WCAG 2.0 Level A.
- Select the five pages that need to be assessed.
- Manually check each webpage on each website against WCAG 2.0 Level A.
- Mark all the errors on each page in the Excel template.
- Summarise the resulting data

3.5.2 Surveys
A survey is a tool for collecting information from a group of people called a “sample”. Data obtained from surveys includes statistical information that needs to be analysed (Fowler, 2014).

For this research, after analysing the outcome from the quantitative methods, sets of online survey questions were sent to the government websites’ developers to test their awareness of website accessibility issues. The survey technique was used to ensure that all necessary data was collected and accurate. The process of this survey consisted of question design, handing surveys to participants, and collecting and evaluating information. The most important part was developing the survey questions, which were comprised of a mixture of open and closed questions, in order to measure the validity of the outcome. Each participant was assigned an identification number with the survey questions to simplify the assessment of the outcome. A reminder email was sent after two weeks for surveys that had not been returned. The number of participants for this research was up to twenty for each country.

Process of sending survey:
• Prepare and set up online survey questions.
• Send all agencies and staff an email asking if they are willing to participate in the online surveys.
• List all the agencies that will participate in the research survey.
• Send an email to each agency with a unique ID number.
• Send a reminder email for agencies that have not completed the online survey.
• Collect and review data.

See survey research questions in Appendixes 1 and 2 for English and Arabic versions.

3.5.3 Interviews
Interviews were used to obtain information, opinions and awareness concerning issues and standards of web accessibility of the e-government websites. The main subjects of the interviews were web developers and government staff who are in contact with and maintain the websites on a daily basis. The purpose of this method was to discover the comprehension level of the web developers and staff regarding web accessibility and related issues, as this group of people implements the web accessibility standards and requirements. The interview process included a selection of the sample group and the techniques used were face-to-face and telephone conference interviews.

Process of interviews:
• Prepare interview questions.
• Send all agencies and staff an email asking if they will participate in the interview.
• List all the agencies that are willing to participate in the interview.
• Arrange a suitable time for either a telephone conference or a face-to-face interview.
• Record the interview.
• Review interview answers.
3.5.4 Document Analysis

- Review the websites of e-government with respect to laws, policies, guidelines, and mentions of disability or people with disabilities in the Arabic language. This study analysed 27 e-government websites for each country.

3.5.4.1 Review of Information Sources:

3.5.4.1.1 Internet:

- Use the Google search engine and enter different Arabic keywords related to disability in the Gulf region.

Method:

- In the Google search engine field, write “Keyword site: URL”. For example: disability site: e.gov.kw

- Search for information in the state library of Kuwait by entering Arabic keywords related to disability in the index of the library system.

3.6 Instruments

According to Sloan, when auditing web accessibility, several methods and tools can be utilised in the process, including automated tools, manual checklists and user evaluation. Some studies employ only a single evaluation tool, while others combine multiple tools, such as automated and manual checklists (Harper & Yesilada, 2008; Sloan, 2010).

In this study, a hybrid assessment approach was used, based on a combination of automated web audits and manual assessment against web accessibility guidelines to assess the e-government websites and their levels of accessibility. Furthermore, particular pages from each website were selected, especially the home page, contact page, e-services page, and the page with tables and forms for manual evaluation to ensure that the websites have met the W3C standards and requirements for web accessibility. Moreover, the manual test was considered only in the Arabic versions of the Gulf websites. However, SortSite was used as an automated tool to evaluate the entirety of government websites and NVDA was selected as the main screen reader to assess the Gulf government websites.
In conclusion, in order to achieve the main purpose of this research, an exploratory approach was implemented with different tools. The case study approach focused on web accessibility in the Gulf States by using automated and manual website assessments, document analysis and web based surveys of site owners.
Chapter 4: Website Assessment Results

The website assessment results section includes the results from three countries: Kuwait, the United Arab Emirates, and Qatar.

Brown and Hollier (2015, para.19) stated:

Whilst an automated assessment tool may be able to check a Web site of 10,000 pages or more in a couple of hours, realistically an expert assessor or group of assessors might spend hours testing a single content heavy page. Whilst the literature is replete with accessibility auditing methodologies, with a focus on the balance between automated and manual assessment, the W3C’s Web site accessibility conformance evaluation methodology (World Wide Web Consortium, 2014b) outlines a five step evaluation procedure consisting of defining the evaluation scope, exploring the target Web site, selecting a representative example of pages, auditing those pages and reporting the findings.

There are seven main sections that indicate the results from manual and automated testing. The first section shows the results based on Web Content Accessibility Guidelines (WCAG) 2.0 Level A. The second section presents the outcomes when considering the six most common criteria from the guidelines. The third section ranks ten ministries from each country. The fourth section compares the results of two common pages (the main page and the “Contact Us” page). The fifth section indicates the findings from the main government websites of Kuwait, the UAE and Qatar. The sixth section presents the overall results for the four main principles of the “POUR” guideline. The last section shows the results obtained through the use of automated tools from the Sortsite software. In order to understand WCAG 2.0, see the guideline link “https://www.w3.org/TR/WCAG20/”.

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Table 4-1 presents the passing percentage of 10 Kuwaiti government websites based on 25 criteria from WCAG 2.0 Level A. According to the table, criterion 3.2.1, “On Focus”, had the highest collective passing percentage at 100% for all sites. This was followed by criterion 2.1.2, “No Keyboard Trap”, which had a 98% passing percentage on all sites. Here, the General Secretariat of the Supreme Court secured an 80% passing score, whereas all the other websites secured a score of 100% for criterion 2.1.2. Criterion 3.2.2, “On Input”, had another comparatively high passing percentage of 74%; however, the coding feature aligned with criterion 3.2.2 had not been implemented in the General Secretariat of the Supreme Court’s
website, so it could not be assessed for a pass or a fail. The Ministry of Higher Education’s site failed to fulfil this same criterion.

Criterion 2.4.3, “Focus Order”, secured the median passing percentage of 56% and was available on all the sites. Criterion 1.4.2, “Audio Control”, and criterion 2.3.1, “Three Flashes or Below Threshold”, had a 50% passing percentage; however, both criteria applied to only two websites.

Furthermore, criterion 2.4.4, “Link Purpose (In Context)”, had a collective 39% passing percentage for all the websites, while criterion 2.4.1, “Bypass Blocks”, and 3.1.1, “Language of Page”, both reflected a collective 10% passing percentage for all the websites. “Error Identification” (criterion 3.3.1) had an 11% passing percentage for all the sites.

With regard to the criteria that secured the lowest passing percentages, “Non-text Content” (1.1.1), “Info and Relationships” (1.3.1), “Meaningful Sequence” (1.3.2), “Pause, Stop, Hide” (2.2.2), and “Parsing” (4.1.1) all had 0% for every website. Criterion 1.2.1, “Audio-Only and Video-Only (Pre-recorded)”, was the only one whose features had not been implemented on any site. “Captions (Pre-recorded)” (1.2.2), “Audio Description or Full Text Alternative” (1.2.3), “Sensory Characteristics” (1.3.3), “Timing Adjustable” (2.2.1), and “Labels or Instructions” (3.3.2) all failed to pass; relevant features had been implemented on some of the sites and were absent from others. “Name, Role, Value” (4.1.2), “Page Titled” (2.4.2), and “Use of Colour” (1.4.1) had passing percentages of 2%, 2%, and 4%, respectively, with relevant features being available on all websites.
Figure 4-1 compares the passing percentage for the aforementioned WCAG 2.0 Level A criteria and the percentage of measurable criteria on all the Kuwaiti government websites that were considered. The percentage of measurable criteria includes any criterion that has been applied and assessed on a Kuwaiti government website. The graph can be interpreted as an indicator of site quality by exploring each criterion and comparing the passing percentage to the percentage of measurable criteria.

In terms of both the measurable criteria and the passing percentage, “On Focus” (3.2.1) had the highest score of 100%, while also being measurable on all the sites. “No Keyboard Trap” (2.1.2) is the next criterion with a passing percentage of 98% and a measurability percentage of 100%. “On Input” (3.2.2) had a passing percentage of 74% and could be measured for all the websites. In terms of measurability, several WCAG 2.0 criteria obtained a score of 100%, including “Use of Colour” (1.4.1), “Keyboard” (2.1.1), “Bypass Blocks” (2.4.1), “Page Titled” (2.4.2), “Focus Order” (2.4.3), “Link Purpose (In Context)” (2.4.4), “Language of Page” (3.1.1), and “Name, Role, Value” (4.1.2). However, these criteria had different passing percentages.
The lowest passing percentages came from “Use of Colour” (1.4.1), “Page Titled” (2.4.2), and “Name, Role, Value” (4.1.2) with scores of only 4%, 2% and 2%, respectively. The lowest percentage for measurability applied to “Audio Control” (1.4.2) and “Three Flashes or Below Threshold” (2.3.1), which both secured 20%.

Criterion 1.2.1, “Audio-only and Video-only (Pre-recorded)”, was the only criterion with a 0% passing percentage, as it was not measurable (not implemented) on any website. In contrast, “Non-text Content” (1.1.1), “Info and Relationships” (1.3.1), “Meaningful Sequence” (1.3.2), “Pause, Stop, Hide” (2.2.2), and “Parsing” (4.1.1) were all 100% in terms of measurability, but failed to pass the test on any site, thus reflecting a score of 0%. “Captions (Pre-recorded)” (1.2.2), “Audio Description or Full Text Alternative” (1.2.3), “Sensory Characteristics” (1.3.3), “Timing Adjustable” (2.2.1), and “Labels or Instructions” (3.3.2) were measurable at 20%, 20%, 30%, 30% and 90%, respectively; however, they failed to pass the test against WCAG 2.0 level A on any website.

It could be argued from the data presented above that high levels of passing percentages for WCAG 2.0 Level A criteria do not necessarily mean that the coding was created to be “Accessible”. Rather, high passing percentages seem to be more related to good web design. In other words, we see accessible design features by accident, whereas the far more specific web accessibility techniques seen in criteria such as 1.1.1, 1.3.1, and 1.4.1 tend to be used only when the developer has a specific reason to employ them. Thus, there appears to be little evidence of actual accessible web design in any of the Kuwaiti sites analysed, beyond the incidental overlap in typical web design practises and accessibility requirements.
Figure 4-2: Kuwaiti website accessibility – percentage of measurable criteria for each ministry

<table>
<thead>
<tr>
<th>Ministry</th>
<th>Measurable Criteria Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Finance</td>
<td>84%</td>
</tr>
<tr>
<td>Ministry of Social Affairs and Labour</td>
<td>84%</td>
</tr>
<tr>
<td>Ministry of Health</td>
<td>80%</td>
</tr>
<tr>
<td>Ministry of Interior</td>
<td>76%</td>
</tr>
<tr>
<td>Ministry of Defence</td>
<td>76%</td>
</tr>
<tr>
<td>The Civil Service</td>
<td>72%</td>
</tr>
<tr>
<td>Ministry of Social Affairs and Labor</td>
<td>72%</td>
</tr>
<tr>
<td>Ministry of Higher Education</td>
<td>72%</td>
</tr>
<tr>
<td>Ministry of Education</td>
<td>72%</td>
</tr>
<tr>
<td>Kuwait Government Online</td>
<td>76%</td>
</tr>
</tbody>
</table>

Figure 4-2 indicates the percentage of measurable criteria for each Kuwaiti ministry website that was considered. The Ministry of Finance and the Ministry of Social Affairs and Labour had the highest percentage of measurable criteria at 84%, followed by the Ministry of Health, with a score of 80%.

The Ministry of Interior, Ministry of Defence, and the Kuwaiti government’s online website hold the median position, with the whole website achieving 76% in terms of measurability. The Ministry of Education, Ministry of Higher Education, Civil Service Commission, and the Secretariat of the Supreme Court had the lowest measurable criteria percentage of 72%.
Figure 4-2 indicates that it was not possible to measure all 25 WCAG 2.0 criteria for any government ministry website. Although the measurability percentage was high for all the websites, certain criteria had not been addressed on every website.

Table 4-2: UAE websites fulfilling the criteria for WCAG 2.0 Level A

<table>
<thead>
<tr>
<th>Table 4-2: UAE websites fulfilling the criteria for WCAG 2.0 Level A</th>
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<tbody>
<tr>
<td><strong>Non-text Content</strong></td>
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<tr>
<td>----------------------</td>
</tr>
<tr>
<td>1.1.1 Non-text Content</td>
</tr>
<tr>
<td>Audio-only and Video-only (Prerecorded)</td>
</tr>
<tr>
<td>1.2.1 Captions (Prerecorded)</td>
</tr>
<tr>
<td>Audio Description or Full Text Alternative</td>
</tr>
<tr>
<td>1.2.2 Meaningful Sequence</td>
</tr>
<tr>
<td>1.3.1 Info and Relationships</td>
</tr>
<tr>
<td>Sensory Characteristics</td>
</tr>
<tr>
<td>1.4.1 Use of Color</td>
</tr>
<tr>
<td>Audio Control</td>
</tr>
<tr>
<td>2.1.1 Keyboard</td>
</tr>
<tr>
<td>2.1.2 No Keyboard Trap</td>
</tr>
<tr>
<td>2.2.1 Timing Adjustable</td>
</tr>
<tr>
<td>2.2.2 Pause, Stop, Hide</td>
</tr>
<tr>
<td>Three Flashes or Below</td>
</tr>
<tr>
<td>2.4.1 Bypass Blocks</td>
</tr>
<tr>
<td>2.4.2 Page Titled</td>
</tr>
<tr>
<td>2.4.3 Focus Order</td>
</tr>
<tr>
<td>2.4.4 Link Purpose (In Context)</td>
</tr>
<tr>
<td>3.1.1 Language of Page</td>
</tr>
<tr>
<td>3.2.1 On Focus</td>
</tr>
<tr>
<td>3.3.1 Error Identification</td>
</tr>
<tr>
<td>3.3.2 Labels or Instructions</td>
</tr>
<tr>
<td>4.1.1 Parsing</td>
</tr>
<tr>
<td>4.1.2 Name, Role, Value</td>
</tr>
</tbody>
</table>

Table 4-2 presents the passing percentage for 10 UAE ministry websites based on select criteria from WCAG 2.0 Level A. According to the table, “On Focus” (3.2.1) was the criterion with the highest collective passing percentage of 96%. All the ministry sites secured at least one score of 100%, except for the Ministry of Labour and the Ministry of Social Affairs, which had top passing percentages of 80%. Furthermore, “Focus Order” (2.4.3) and “No Keyboard Trap” (2.2.2) were also notable for their high passing rates.
“Trap” (2.1.2) had the second highest passing percentages of 86% collectively across all websites. The Ministries of Interior, Finance, Education, and Higher Education, as well as the UAE’s MyGov site all secured a 100% passing percentage for these three criteria – 3.2.1, 2.4.3 and 2.1.2.

As far as median passing percentage is concerned, “Use of Colour” (1.4.1) had a 26% collective passing percentage, with the Ministries of Education and Finance securing scores of 100% and the Ministry of Interior getting a score of 60%. All the other websites failed to pass the “aligned coding” aspect of the criterion.

“Non-text Content” (1.1.1) and “Parsing” (4.1.1) failed to pass the criteria test across all the websites. Additionally, “Name, Role, Value” (4.1.2), “Meaningful Sequence” (1.3.2), “Info and Relationships” (1.3.1), and “Bypass Blocks” (2.4.1) had low collective passing percentages of 2%, 2%, 4% and 6%, respectively. The Ministry of Interior was the only website that had passing percentages of 40% for “Info and Relationships” (1.3.1) and 20% for “Meaningful Sequence” (1.3.2); all the other websites failed to pass the tests for these criteria. Similarly, in terms of “Bypass Blocks” (2.4.1) and “Name, Role, Value” (4.1.2), the Ministry of Education was the only site to score 20% and 100%, respectively. Again, all the other websites failed to pass the tests for criteria 2.4.1 and 4.1.2.
Figure 4-3 depicts the passing percentage and percentage of measurable criteria for all UAE ministry sites based on WCAG 2.0 Level A. “On Focus” (3.2.1) was the criterion that was 100% measurable and had the highest passing percentage of 96%. “Focus Order” (2.4.3) and “No Keyboard Trap” (2.1.2) were also 100% measurable across all the websites, but had an 86% collective passing percentage. In terms of measurability, 17 out of the 25 criteria were 100% measurable on all the websites.

“Error Identification” (3.3.1) and “Use of Colour” (1.4.1) secured the median passing percentage position with the criteria being 100% measurable on all the sites, but having collective passing percentages of 26% and 31%, respectively. “Pause, Stop, Hide” (2.2.2) was the criterion that had the median measurability across the sites at 50%, with some of the websites failing to pass the test.
In terms of lowest passing percentages, “Info and Relationships” (1.3.1), “Meaningful Sequence” (1.3.2), “Bypass Blocks” (2.4.1), and “Name, Role, Value” (4.1.2) collectively passed with 4%, 2%, 6% and 2%, respectively, for all the websites; these criteria were measurable on all the sites. “Non-text Content” (1.1.1), “Labels or Instructions” (3.3.2), and “Parsing” (4.1.1) were 100% measurable across the sites. However, none of the websites managed to pass the test.

“Audio Control” (1.4.2) and “Three Flashes and Below Threshold” (2.3.1) had a collective measurability of 30%, but on the websites where the criteria were tested, high passing percentages of 91% and 100%, respectively, were observed. “Pause, Stop, Hide” (2.2.2) is the criterion that was 50% measurable on the sites; however, none of them passed the test. Criterion 1.2.1, “Audio-only and Video-only (Pre-recorded)”, was the only one not implemented on any website.

The data presented in Figure 4-3 shows that the criteria with high passing percentages were more a product of good web design than accessibility-related considerations. Pure accessibility-related criteria, including “Non-text Content” (1.1.1), “Info and Relationships” (1.3.1) and “Meaningful Sequence” (1.3.2), were used by the developer only when specific reasons for them were raised. Thus, it can be said that evidence of actual accessibility for any of the websites was not present, as such requirements were fulfilled only when they were the result of web design overlap or essential to a specific accessibility requirement.
Figure 4-4 shows the measurability of WCAG 2.0 Level A criteria for the 10 UAE government ministry websites considered in the study. The highest percentage for WCAG 2.0 criteria was seen with the UAE government’s site, which was 80% measurable.

The Ministries of Social Affairs, Labour, and Higher Education represent the median in measurability with scores of 76%, followed by the Ministries of Health, Interior, Finance, and Education, as well as the Al-Majles website, all of which were 72% measurable. The lowest measurability percentage was seen with the UAE’s MyGov site, which had a score of 68% per the defined WCAG 2.0 criteria.

Evaluating Figure 4-4, it can be said that most of the websites were measurable against WCAG 2.0 criteria; however, these Ministers did not show any positive results, since a great absence of various criteria was observed on all the sites.
Table 4-3: Qatari websites fulfilling criteria for WCAG 2.0 Level A

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1.1 Non-text Content</td>
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<td>0%</td>
<td>0%</td>
<td>0%</td>
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<td>20%</td>
<td>0%</td>
<td>40%</td>
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<td>NA</td>
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<td>NA</td>
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</tr>
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<td>0%</td>
<td>0%</td>
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<tr>
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<td>80%</td>
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<td>20%</td>
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<tr>
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<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
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</tr>
<tr>
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<td>100%</td>
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<td>100%</td>
<td>100%</td>
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<td>100%</td>
<td>100%</td>
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<td>100%</td>
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<td>NA</td>
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<td>NA</td>
</tr>
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<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
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<td>60%</td>
<td>100%</td>
<td>100%</td>
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<td>40%</td>
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<td>60%</td>
<td>0%</td>
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<td>80%</td>
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<td>3.1.2 On Focus</td>
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<td>100%</td>
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<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>3.2.1 Error Identification</td>
<td>100%</td>
<td>60%</td>
<td>60%</td>
<td>100%</td>
<td>100%</td>
<td>60%</td>
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<td>0%</td>
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<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
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<td>0%</td>
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</tr>
<tr>
<td>3.3.3 Name, Role, Value</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>20%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Table 4-3 shows the passing percentage for all 10 Qatari government websites by using WCAG 2.0 Level A. The highest passing percentage applied to criterion 3.2.1, “On Focus”, which had a score of 100% on all the websites, followed by criteria 2.1.2, “No Keyboard Trap” and 2.4.3, “Focus Order,” which scored 96% and 92%, respectively, across all the websites. The Ministry of Higher Education was the only website to score a 60% passing percentage for “No Keyboard Trap” (2.1.2), while all the other websites passed with 100%. Similarly, the Ministry of Foreign Affairs and the Ministry of Social Affairs and Labour both had passing percentages of 60% for “Focus Order” (2.4.3), while all the other websites scored 100%.
The criteria that reflect median passing percentages include “Error Identification” (3.3.1) at 37% and “Bypass Blocks” (2.4.1) at 35%. The Ministry of Higher Education and the Ministry of Communication were the only ones to fail the 3.3.1 criteria testing; all the other sites had mixed results. In terms of criterion 2.4.1, half of the sites failed to meet the coding requirement, while four sites – the Ministries of Health, Higher Education, and Information and Communication as well as the Public Works Authority – had high passing percentages.

The criteria that had the lowest passing percentages were “Non-text Content” (1.1.1) at 6%, “Info and Relationships” (1.3.1) at 8%, and “Labels or Instructions” (3.3.2) at 7%, with most of the sites failing to pass the test entirely. For example, the Qatari government’s site was the only one that fulfilled criterion 1.3.1 with a score of 80%; all the other sites failed. Similarly, the Ministry of Public Health and the Qatari government’s site were the only ones to fulfil criterion 3.3.2 with passing percentages of 20% and 40%, respectively. For criterion 1.1.1, the Ministry of Education had a score of 20% and the Qatari government’s site scored 40%. Again, all the other sites failed the test.

The coding features aligned with “Sensory Characteristics” (1.3.3), “Audio Control” (1.4.2), and “Timing Adjustable” (2.2.1) had not been implemented on any site and were therefore not measurable. “Audio-only and Video-only (Pre-recorded)” (1.2.1), “Captions (Pre-recorded)” (1.2.2), “Audio Description or Full Text Alternative” (1.2.3), “Pause, Stop, Hide” (2.2.2), and “Parsing” (4.1.1) were not measurable on most of the sites and failed the criteria tests when they were present.
Figure 4-5: Qatari website accessibility – criteria passing percentage and percentage of measurable criteria for WCAG 2.0 Level A

Figure 4-5 shows the criteria passing percentages and measurable criteria percentages for 25 WCAG 2.0 Level A criteria across the 10 Qatari government sites that were assessed. The graph shows that criterion 3.2.1, “On Focus”, secured the highest passing percentage and was 100% measurable on all the sites. “No Keyboard Trap” (2.1.2) at 95% and “Focus Order” (2.4.3) at 92% had the next highest passing percentages and were also 100% measurable. In all, 16 criteria were 100% measurable with different passing percentages.

“Error Identification” (3.3.1) at 37% and “Bypass Blocks” (2.4.1) at 35% had the median passing percentages, and both were 100% measurable on all the sites. In terms of measurability, there were some features aligned to “Pause, Stop, Hide” (2.2.2) on half of the sites; however, none of them passed the test.
The lowest passing percentages came from “Non-text Content” (1.1.1) at 6% and “Labels or Instructions” (3.3.2) at 7%. Both criteria were 100% measurable on all the sites. The lowest measurable criteria percentage of 10% applied to both “Captions (Pre-recorded)” (1.2.2) and “Audio Description or Full Text Alternative” (1.2.3), with all eligible sites failing the test. Criterion 2.3.1, “Three Flashes or Below Threshold”, was 20% measurable with a 33% passing percentage.

The data analysed above shows high passing percentages for certain criteria, while others were completely absent. Therefore, it is likely that the coding requirements for the Qatari government sites were not strictly related to accessibility; instead, they were probably more concerned with web design. Accessibility accidentally became a factor on these sites, with specific accessibility criteria fulfilling WCAG 2.0 Level A when there was a particular reason to do so.

Figure 4-6: Qatari website accessibility – percentage of measurable criteria for each ministry

Figure 4-6 sheds light on the measurable criteria percentage for all of the Qatari government sites that were tested. The Qatar Tourism Authority had the highest amount of measurable
criteria or coding requirements that were in alignment with most of the WCAG 2.0 Level A criteria, with 84% measurability.

The median measurable criteria percentage of 76% applied to both the Ministry of Higher Education and the Ministry of Interior, whereas the Ministry of Foreign Affairs and the Ministry of Education were each 72% measurable.

The Ministries of Public Health, Social Affairs and Labour, and Communication, as well as the Public Works Authority and the Qatari government’s site, secured the lowest measurable criteria percentage of 68%.

All in all, a high percentage of criteria could be tested on the sites; however, certain criteria were missing completely across all the sites, thus hindering the measurability of those criteria. The Qatari sites lack accessibility features, especially for criteria that specifically address accessibility concerns. The accessibility features that are present were likely the result of overlapping considerations in the web design process.
Table 4-4: Websites fulfilling WCAG 2.0 Level A criteria in Kuwait, the UAE, and Qatar

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Kuwait</th>
<th>UAE</th>
<th>Qatar</th>
<th>Percentage of Pass</th>
<th>Average of Pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1.1 Non-text Content</td>
<td>0%</td>
<td>0%</td>
<td>6%</td>
<td>2%</td>
<td>1.0</td>
</tr>
<tr>
<td>1.2.1 Audio-only and Video-only (Prerecorded)</td>
<td>NA</td>
<td>NA</td>
<td>0%</td>
<td>0%</td>
<td>0.0</td>
</tr>
<tr>
<td>1.2.2 Captions (Prerecorded)</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0.0</td>
</tr>
<tr>
<td>1.3.1 Info and Relationships</td>
<td>0%</td>
<td>4%</td>
<td>8%</td>
<td>2%</td>
<td>2.0</td>
</tr>
<tr>
<td>1.4.1 Use of Color</td>
<td>0%</td>
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<td>NA</td>
<td>0%</td>
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<td>2.1.1 Keyboard</td>
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<td>10%</td>
<td>32%</td>
<td>17%</td>
<td>8.3</td>
</tr>
<tr>
<td>2.1.2 No Keyboard Trap</td>
<td>98%</td>
<td>86%</td>
<td>96%</td>
<td>93%</td>
<td>46.7</td>
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<tr>
<td>2.1.3 Timing Adjustable</td>
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<td>100%</td>
<td>NA</td>
<td>20%</td>
<td>0.3</td>
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<tr>
<td>2.2.1 Pause, Stop, Hide</td>
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<td>100%</td>
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<td>8.3</td>
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<td>92%</td>
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<td>100%</td>
<td>98%</td>
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<td>82%</td>
<td>36.3</td>
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<td>3.2.2 Labels or Instructions</td>
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<td>0%</td>
<td>7%</td>
<td>2%</td>
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<td>2%</td>
<td>20%</td>
<td>4%</td>
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</table>

Table 4-4 shows the overall passing percentages for the government sites of Kuwait, the UAE, and Qatar that were tested using the 25 WCAG 2.0 Level A criteria. “On Focus” (3.2.1) had the highest passing percentage of 99% across 100% of the Qatari and Kuwaiti sites and 96% of the UAE sites. The highest average passing score was 49.0 for each site.Criterion 2.1.2, “No Keyboard Trap”, had the second highest passing percentage of 93% with an average passing score of 46.7.

In terms of the median passing percentage, “Use of Colour” (1.4.1) secured a 40% collective passing percentage, with 88% of the Qatari sites passing, 26% of the UAE sites passing, and only 4% of the Kuwaiti sites passing. The average figure for passing percentage per site was 19.7.
The lowest collective passing percentage was 2% for both “Non-text Content” (1.1.1) and “Labels or Instructions” (3.3.2), with an average passing percentage per site of 1.0. The Qatari sites had a 6% passing percentage for criterion 1.1.1, whereas none of the UAE or Kuwaiti sites passed the test. Similarly, the Qatari sites had a 7% passing percentage for criterion 3.3.2, while again, none of the UAE or Kuwaiti sites passed.

None of the sites passed the tests for “Captions (Pre-recorded)” (1.2.2), “Audio Description or Full Text Alternative” (1.2.3), “Pause, Stop, Hide” (2.2.2), or “Parsing” (4.1.1). “Audio-only and Video-only (Pre-recorded)” (1.2.1) and “Sensory Characteristics” (1.3.3) were only measurable for one country and yielded no passes. “Timing Adjustable” (2.2.1) had a collective passing percentage of 20%, with the UAE sites passing by 100% and none of the Kuwaiti sites passing. It was not possible to measure the criterion on any Qatari site. The average passing percentage for criterion 2.2.1 per site rested at 0.3.

Figure 4-7: Website accessibility in Kuwait, the UAE, and Qatar – criteria passing percentage and percentage of measurable criteria for WCAG 2.0 Level A
Figure 4-7 shows the overall passing percentage for Kuwaiti, UAE, and Qatari government websites based on WCAG 2.0 Level A. According to the calculated data, “On Focus” (3.2.1) had the highest overall passing percentage and measurable criteria, followed by “No Keyboard Trap” (2.1.2), which had a 93% overall passing percentage and was 100% measurable on all the sites. In terms of measurability, 21 out of the 25 criteria were 100% measurable.

Criterion 2.3.1, “Three Flashes and Below Threshold”, scored the overall median passing percentage of 67% and was 100% measurable across all the websites of the three countries. The median percentage for measurability was 67% for both “Audio Control” (1.4.2) and “Timing Adjustable” (2.2.1), with passing percentages of 85% and 20%, respectively.

In terms of the lowest overall passing percentages, “Info and Relationships” (1.3.1) scored 4%, “Labels or Instructions” (3.3.2) scored 2%, and “Non-text Content” (1.1.1) scored 2%; the criteria tested on every site were 100% measurable. Although also 100% measurable, “Captions (Pre-recorded)” (1.2.2), “Audio Description or Full Text Alternative” (1.2.3), “Pause, Stop, Hide” (2.2.2), and “Parsing” (4.1.1) all failed the tests conducted on the various sites. The lowest measurable criteria percentage was observed for “Audio-only and Video-only (Pre-recorded)” (1.2.3) and “Sensory Characteristics” (1.3.3), with none of the websites securing a pass.

“Audio Control” (1.4.2) was 67% measurable and had an 85% passing percentage, while “Timing Adjustable” (2.2.1) had a 20% passing percentage and was also 67% measurable.
Figure 4-8 shows the overall measurable criteria percentage for all of the ministries considered in Kuwait, the UAE and Qatar based on WCAG 2.0 Level A. The Kuwaiti sites had the highest amount of criteria available for testing with a score of 96%, while the UAE sites secured the median position with a score of 92%. The Qatari sites had the lowest measurability percentage of 88%.

The data analysis of the findings in Figure 4.1-8 reveals that even though many of the criteria being considered are measurable, accessibility-specific criteria were not measurable due to the associated coding. This indicates that there is a major accessibility gap between the coding found on individual sites and WCAG 2.0 coding requirements.
4.2 The Six Most Common WCAG 2.0 Level A Criteria

4.2.1 Kuwait

Table 4-5: Kuwaiti websites – average errors for the six most common criteria

Table 4-5 shows the average number of errors on five pages found on the 10 Kuwaiti government sites for the six most common WCAG 2.0 Level A criteria.

The table reveals that “Non-text Content” (1.1.1) and “Info and Relationships” (1.3.1) had the greatest number of errors, with 100% of the government sites scoring the maximum five errors which mean none of these criteria passed e-government webpages. In terms of websites, the Ministries of Health, Defence, Social Affairs and Labour, and Higher Education, as well as the Civil Service Commission and the General Secretariat of the Supreme Court, all had the maximum number of errors for the six criteria, with a total of 30 errors in all the criteria and an average of five errors per criterion.

“Page Titled” (2.4.2) with a score of 98% and “Keyboard” (2.1.1) with a score of 96% across all the government sites held the median position. In terms of sites, the Ministries of Interior and Defence had an average error number of 4.8, with 29 total errors for the six criteria.

The lowest number of errors collectively across all the sites was found for “Bypass Blocks” (2.4.1) at 80%, followed by “Language of Page” (3.1.1) at 82%. Moreover, the Ministry of Education and the Kuwaiti government’s site had 20 errors in total, the lowest number, with the average number of errors resting at 3.3.
Figure 4-9 presents the average number of errors found on five pages of 10 Kuwaiti government sites based on the six WCAG 2.0 Level A criteria. These are errors that occurred while the websites were being tested. Figure 4-9 offers information on which criteria were completely unmet by the government sites and which were at least partially fulfilled.

According to the figure, “Non-text Content” (1.1.1) and “Info and Relationships” (1.3.1) had the most errors or proved to be criteria that none of the sites fulfilled, with an average of five errors which mean none of the Kuwait e-government webpages passed the criteria.

The median criteria with the most average number of errors were “Keyboard” (2.1.1) with a score of 4.8 and “Page Titled” (2.4.2) with a score of 4.9 out of 5.0.

The lowest averages for number of errors came from “Bypass Blocks” (2.4.1) and “Language of Page” (3.1.1), which had averages of 4.0 and 4.1 errors, respectively.
The data above clearly reveals how the Kuwaiti sites lacked certain basic accessibility-related elements, with only a few being available on select sites. In these cases, incorporation of the criteria resulted by default from the overlap between web design considerations and accessibility requirements.

**Figure 4-10: Kuwaiti websites – percentage of errors by government websites for six common criteria**

![Percentage of errors for each ministry](image)

Figure 4-10 sheds light on the percentages of error on five pages for 10 Kuwaiti government sites based on six common WCAG 2.0 Level A criteria. The graph charts the collective error percentages for the six criteria, revealing which sites had the most errors, which failed to pass the criterion coding tests, and which managed to pass it by a small percentage. The recorded errors indicate that a given site has failed the WCAG 2.0 criterion test.

According to Figure 4-10, the Ministries of Health, Defence, Social Affairs and Labour, and Higher Education, as well as the Civil Service Commission and the General Secretariat of the Supreme Court, had the highest number of errors for the six criteria at 100%. The Ministries
of Interior and Finance had a score of 97% for errors across all six criteria. The Ministry of Education and the Kuwaiti government’s site had the lowest score of 67% errors.

The information presented in Figure 4-10 reveals that most sites failed the test for the six most common WCAG 2.0 criteria. The websites that addressed accessibility did so only marginally when the developer felt that use of the criterion was unavoidable. Thus, consideration of accessibility in web design is rather weak in the analysed sites and only those areas that were directly related to accessibility specifically catered to it.

4.2.2 The UAE

Table 4-6: UAE websites – average errors for the six most common criteria

<table>
<thead>
<tr>
<th>E-government</th>
<th>1.1.1 Non-text Content</th>
<th>1.3.1 Info and Relationships</th>
<th>2.1.1 Keyboard</th>
<th>2.4.1 Bypass Blocks</th>
<th>3.1.1 Page Title</th>
<th>3.3.1 Language</th>
<th>Avg</th>
<th>Total Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Health</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>4.7</td>
<td>28</td>
</tr>
<tr>
<td>Ministry of Social Affairs</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4.8</td>
<td>29</td>
</tr>
<tr>
<td>Ministry of labour</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4.8</td>
<td>29</td>
</tr>
<tr>
<td>Ministry of Interior</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5.0</td>
<td>30</td>
</tr>
<tr>
<td>Ministry Of Finance</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5.0</td>
<td>30</td>
</tr>
<tr>
<td>Ministry of Higher Education</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5.0</td>
<td>30</td>
</tr>
<tr>
<td>Ministry of Education</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>3.3</td>
<td>20</td>
</tr>
<tr>
<td>UAE- Government Online</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5.0</td>
<td>30</td>
</tr>
<tr>
<td>UAE- Almajles National</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5.0</td>
<td>30</td>
</tr>
<tr>
<td>mygove uae</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5.0</td>
<td>30</td>
</tr>
<tr>
<td>Errors</td>
<td>100%</td>
<td>100%</td>
<td>98%</td>
<td>90%</td>
<td>92%</td>
<td>92%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 4-6 reveals the average number of errors on five pages found on the 10 UAE government sites that were tested while considering the six most common WCAG 2.0 Level A criteria. “Non-text Content” (1.1.1) and “Info and Relationships” (1.3.1) had the highest average number of errors at 100%, with all sites showing five errors, thus offering proof that neither criteria were implemented by the developer in the accessibility coding. In terms of websites, the Ministries of Interior, Finance, and Higher Education, as well as the UAE government’s site, the Al-Majles site and the UAE’s MyGov site, all had an average of five errors for all the criteria, with the total number of errors calculated at 30 per site.

At the median level, “Keyboard” (2.1.1) had a collective score of 98% for all the sites and “Bypass Blocks” (2.4.1) had a score of 90%. The Ministry of Social Affairs and the Ministry of
Labour both had 29 errors in total, while the average number of errors rested at 4.8; closely following, the Ministry of Health had 28 total errors and an average of 4.7 errors.

The lowest average number of errors with respect to the six common criteria that were selected came from “Page Titled” (2.4.2) and “Language of Page” (3.1.1), which had a score of 92% collectively across all the sites. The Ministry of Education had the lowest average number of errors at 3.3 with a total of 20 errors.

Figure 4-11: UAE websites – average errors for the six most common criteria on five pages

Figure 4-11 shows the average number of errors for six common WCAG 2.0 Level A criteria that were tested on five pages of every UAE government site considered in this study. The graph reveals the results after each of the five pages was analysed based on the six selected criteria, by checking the compatibility of a given site’s coding features against WCAG 2.0 coding principles.

The results of the tests reveal that the highest number of errors applied to the “Non-text Content” (1.1.1) and “Info and Relationships” (1.3.1) criteria. All five pages tested for these criteria resulted in errors.
The median number of errors came from “Keyboard” (2.1.1), which had an average of 4.9 errors, followed by “Page Titled” (2.4.2) and “Language of Page” (3.1.1), both of which had an average of 4.6 errors on all the sites. “Bypass Blocks” (2.4.1) had the lowest average of 4.5 errors for all six selected criteria.

The above data makes it obvious that none of the government sites actually applied accessibility-specific design considerations when the websites were being built. Instead, the current level of accessibility seems to be accidental in nature, occurring only as a result of overlapping web design and accessibility requirements. It was also found that the developers only used the WCAG 2.0 criteria when they had specific cause to do so, further strengthening the finding that accessibility criteria had not actually been applied on the UAE government sites.

Figure 4-12: UAE websites – percentage of errors by government websites for six common criteria

Figure 4-12 reveals the error percentage for each UAE government site assessed based on six common WCAG 2.0 Level A criteria. The graph presents the individual percentages of error
for all six criteria on each site. The graph sheds light on the application of the defined criteria, testing the websites for the six items. This ultimately revealed the percentages of error, pointing out how well each criterion was applied in a website’s coding.

The Ministries of Interior, Finance, and Higher Education, as well as the UAE government’s site, the Al-Majles site, and the UAE’s MyGov site, all had the highest percentage of error – 100% – for all the selected criteria.

The Ministries of Health, Social Affairs, and Labour held the median position with an error percentage of 97%, while the Ministry of Education had the lowest error percentage of 67% for all six selected criteria.

The results of the graph emphasise that accessibility-specific criteria were not implemented on the government websites. The only accessibility-related implementations experienced on the sites were the result of instances where the developer had specific cause to use them.

The graph clearly indicates that actual web accessibility does not exist on any UAE government site.

4.2.3 Qatar

Table 4-7: Qatari websites – average errors for the six most common criteria

Table 4-7 reveals the average number of errors based on six common WCAG 2.0 Level A criteria for all the Qatari government sites that were tested. The average number of errors per site was calculated by testing five pages of each site.
The information from the table shows that “Non-text Content” (1.1.1) had the highest number of errors, scoring 94%. This was followed by the “Info and Relationships” (1.3.1) criterion, which had a score of 92%. In terms of websites, the Ministry of Interior had the highest number of errors, with an average of 4.7 errors and a total of 28 errors in all.

“Keyboard” (2.1.1) and “Page Titled” (2.4.2) held the median position; they both had a score of 68% across all 10 Qatari government sites. “Bypass Blocks” (2.4.1) had a percentage of 62%, while the Ministry of Social Affairs and Labour, the Qatar Tourism Authority, and the Ministry of Foreign Affairs had 25 total errors with an average of 4.2 errors.

The lowest average number of errors came from “Language of Page” (3.1.1), which had a 26% score collectively for all the Qatari sites. Moreover, the Qatari government’s site had the lowest number of errors for all six criteria, with 10 total errors and an average of 1.7 errors.

Figure 4-13: Qatari websites – average errors for the six most common criteria on five pages

![Qatar - Average Errors](image)

Figure 4-13 reveals the average number of errors found on five pages of each Qatari government site being considered with regard to the six most common WCAG 2.0 Level A criteria. The tests were performed on five pages of every site, after which the average results.
were compiled for the selected criteria. The graph reveals the extent to which the criteria were applied on various Qatari government sites, providing insight on how well accessibility considerations were included on the government sites.

The highest average number of errors came from “Non-text Content” (1.1.1), which had 4.7 errors, followed by “Info and Relationships” (1.3.1) with 4.6 errors across all the sites.

“Keyboard” (2.1.1) and “Page Titled” (2.4.2) had an average of 3.4 errors. “Bypass Blocks” (2.4.1) was the median criterion with an average of 3.1 errors. “Language of Page” (3.1.1) was the criterion with the lowest average of 1.3 errors on all the sites.

The information in Figure 4-13 shows that even though the number of errors for web accessibility criteria was comparatively low on Qatari government sites, proper web accessibility features were still non-existent. Most of the coding requirements that were included were more design-specific than accessibility-specific. The accessibility designs that were included on the sites were accidental and occurred when the developer felt the specific need to do so.

Figure 4-14: Qatari websites – percentage of errors by government website for six common criteria
Figure 4-14 shows the percentages of error found for various Qatari government sites based on six common WCAG 2.0 Level A criteria. The graph offers information related to the number of errors found on government sites, which reflects how accessible the different government websites were.

According to the information on the graph, the Ministry of Interior had the highest error percentage – 93% – among all the government sites.

The median error percentages came from the Ministry of Social Affairs and Labour, the Qatar Tourism Industry, and the Ministry of Foreign Affairs, which all scored 83%. They were followed by the Public Works Authority with 63%.

The Qatari government’s site showed the maximum level of integration by far when the WCAG 2.0 test was applied, revealing the lowest error percentage of 33%.

The graph’s data shows that while some sites had better web accessibility in their design and coding, other websites only incorporated the WCAG 2.0 criteria that were deemed essential. The Qatari government’s site proved to best meet the WCAG 2.0 requirements; however, it too failed to meet some criteria, as revealed in its error percentage of 33%.

4.2.4 Overall: Kuwait, the UAE, and Qatar

Table 4-8: Kuwaiti, the UAE, and Qatari websites – average errors for the six most common criteria

<table>
<thead>
<tr>
<th>Country</th>
<th>1.1.1 Non-text Content</th>
<th>1.3.1 Info and Relation</th>
<th>2.1.1 Keyboard</th>
<th>2.4.1 Bypass Blocks</th>
<th>2.4.2 Page Title</th>
<th>3.1.1 Language</th>
<th>AVG</th>
<th>Total Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kuwait</td>
<td>50</td>
<td>50</td>
<td>48</td>
<td>40</td>
<td>49</td>
<td>41</td>
<td>46.3</td>
<td>278</td>
</tr>
<tr>
<td>UAE</td>
<td>50</td>
<td>50</td>
<td>49</td>
<td>45</td>
<td>46</td>
<td>46</td>
<td>47.7</td>
<td>286</td>
</tr>
<tr>
<td>Qatar</td>
<td>47</td>
<td>46</td>
<td>34</td>
<td>31</td>
<td>34</td>
<td>13</td>
<td>34.2</td>
<td>205</td>
</tr>
<tr>
<td>Errors</td>
<td>98%</td>
<td>97%</td>
<td>87%</td>
<td>77%</td>
<td>86%</td>
<td>67%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4-8 reveals the overall average number of errors found for the government sites of Kuwait, the UAE, and Qatar based on six common WCAG 2.0 Level A criteria. The table shows the average and total number of errors, along with the collective error percentages for all the
government sites. After five pages from each site were evaluated for the six most common criteria, the average number of errors was calculated for the 50 total pages tested.

The UAE sites had the highest average number of errors, 47.7, with 286 total errors out of 300 tests. The median position was held by the Kuwaiti sites, which had an average of 46.3 errors with a total of 278 errors for the six criteria. The lowest number of errors came from the Qatari government sites. They had an average of 34.2 errors with a total of 205 errors in all.

In terms of the criteria, “Non-text Content” (1.1.1) had the highest collective number of errors overall for all the sites with a score of 98%. This was followed by “Info and Relationships” (1.3.1), which had a score of 97%.

The median number of errors overall came from “Keyboard” (2.1.1) with 87% and “Page Titled” (2.4.2) with 86%, whereas the lowest overall error percentage applied to “Language of Page” (3.1.1) with 67% and “Bypass Blocks” (2.4.1) with 77%.

Figure 4-15 shows the overall average number of errors for six common WCAG 2.0 Level A criteria found across all the government sites that were tested. To calculate the overall

![Figure 4-15: Kuwaiti, UAE, and Qatari websites – average errors for the six most common criteria](image-url)
average number of errors, WCAG 2.0 Level A was used as the standard. The graph sheds light on which criteria had errors on various government sites. This information can be used to assess each site and its quality in terms of web accessibility.

Figure 4-15 shows that “Non-text Content” (1.1.1) had the highest overall average, resulting in 49 out of 50 total errors. “Info and Relationships” (1.3.1) also had a high overall score of 48.7 errors, while “Keyboard” (2.1.1) and “Page Titled” (2.4.2) held the median overall scores of 43.7 and 43.0 errors, respectively.

The criteria that had the lowest overall averages were “Language of Page” (3.1.1) with 33.3 errors and “Bypass Blocks” (2.4.1) with 38.7 errors.

The graph’s data reveals that as far as specific web accessibility criteria were concerned; relevant coding techniques were applied only when the developers had to consider such factors. Accessibility was not a main motivating factor. Thus, the sites were created more heavily from a web design perspective, resulting in a high number of errors, especially for criteria 1.1.1 and 1.3.1.

Figure 4-16: Kuwaiti, UAE, and Qatari websites – percentage of errors by government website for six common criteria
Figure 4-16 shows the overall percentages of error for the three countries’ government sites based on six common WCAG 2.0 Level A criteria. The graph offers insights on the overall number of errors found for the criteria and shows which country’s sites were especially flawed.

The UAE sites had the highest error percentage of 95%, followed by the Kuwaiti sites, which had the median error percentage of 93%. The lowest error percentage came from the Qatari sites at 68% based on the six common criteria.

Figure 4-16 allows for the simple interpretation of which country’s sites had more trouble passing the WCAG 2.0 test and which country’s sites better integrated the WCAG 2.0 coding requirements.

**Figure 4-17: Kuwaiti, UAE, and Qatari websites – average errors for the six most common criteria on five pages**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Qatar</th>
<th>UAE</th>
<th>Kuwait</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1.1 Non-text Content</td>
<td>4.7</td>
<td>4.6</td>
<td>4.6</td>
</tr>
<tr>
<td>1.3.1 Info and Relationships</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>2.1.1 Keyboard</td>
<td>4.9</td>
<td>4.8</td>
<td>4.5</td>
</tr>
<tr>
<td>2.4.1 Bypass Blocks</td>
<td>4</td>
<td>3.1</td>
<td>3.4</td>
</tr>
<tr>
<td>2.4.2 Page Titled</td>
<td>4.6</td>
<td>3.4</td>
<td>4.9</td>
</tr>
<tr>
<td>3.1.1 Language of Page</td>
<td>4.6</td>
<td>1.3</td>
<td>4.1</td>
</tr>
</tbody>
</table>
Figure 4-17 reveals the average number of errors based on the six common WCAG 2.0 Level A criteria that were tested on five pages of each government site across the three countries. The graph shows the average number of errors for the government sites collectively, allowing for the proper assessment of a given site’s quality with regard to the six common criteria.

The highest average number of errors was collected for “Non-text Content” (1.1.1) and “Info and Relationships” (1.3.1), with the UAE and Kuwait scoring five errors on the various criteria. The Qatari sites had a score of 4.7, the highest average number of errors for the criteria.

As far as the median average number of errors is concerned, as far as the median average number of errors is concerned, “Page Titled” (2.4.2) and “Language of Page” (3.1.1) both had an average of 4.6 errors across the UAE government sites. Kuwaiti sites had the median number of errors for “Keyboard” (2.1.1), and all Kuwaiti government sites had an average of 4.8 errors. “Keyboard” (2.1.1) and “Page Titled” (2.4.2) were the criteria that scored the median number of errors for all Qatari sites, with 3.4 errors on average.

The lowest average number of errors for the UAE and Kuwaiti sites came from “Bypass Blocks” (2.4.1), with averages of 4.5 and 4.0, respectively. In contrast, for Qatari sites, the “Language of Page” (3.1.1) criterion yielded the lowest average of 1.3 errors.

The graph’s data is vital to understand how well the three countries satisfied the WCAG 2.0 test. The graph sheds light on the fact that some major accessibility criteria were ignored by various site developers. Although some criteria, such as 1.1.1, may show relatively fewer errors, there is still a need to integrate more features in order to enhance web accessibility.
Figure 4-18: Kuwaiti, UAE, and Qatari websites – percentage of errors for six common criteria across five common ministries

Figure 4-18 shows the percentage of errors for five common ministries across Kuwait, the UAE, and Qatar based on WCAG 2.0 Level A criteria. The graph makes it possible to assess website quality and allows error percentage to be evaluated through WCAG 2.0 feature alignment tests.

As far as the Ministry of Health is concerned, the highest error percentage was seen in the Kuwaiti ministry site, whereas the median error percentage was found for the UAE ministry site. Qatar’s health ministry site, in comparison to the other two, had the lowest error percentage.

Similarly, the Kuwaiti Ministry of Social Affairs and Labour had the highest percentage of error, at 100%, followed by the UAE ministry at 97%. Qatar again had the lowest percentage of error with 83%.
The Ministry of Interior had the highest error percentages for all three countries’ sites, with the UAE ministry site scoring 100%, the Kuwaiti ministry site scoring 97%, and the Qatari ministry site scoring 93%.

The Ministry of Higher Education was another common site with high percentages of errors for all three countries. Both the Kuwaiti and UAE ministries scored 100%, while Qatar again had the lower error percentage of 90%.

The Ministry of Education had the lowest error percentage for all three countries’ sites. Both the UAE and Kuwaiti ministry sites scored 67%, while the Qatari ministry site had a percentage of 60%.

The data for the error percentages reveals that the Kuwaiti ministry sites had the highest collective number of errors, whereas the UAE sites held the median position. As reflected in every ministry comparison, Qatar was found to have the lowest number of errors for all of its sites when compared to the other two countries.

4.3 Ranking

4.3.1 Kuwait

Table 4-9: Kuwaiti websites – ranking

<table>
<thead>
<tr>
<th>E-government</th>
<th>Total Pages</th>
<th>Total errors</th>
<th>Total Pass</th>
<th>N/A</th>
<th>Percentage of Pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Health</td>
<td>5</td>
<td>81</td>
<td>11</td>
<td>33</td>
<td>12%</td>
</tr>
<tr>
<td>General Secretariat of the Supreme Council</td>
<td>5</td>
<td>68</td>
<td>10</td>
<td>47</td>
<td>13%</td>
</tr>
<tr>
<td>Ministry of Interior</td>
<td>5</td>
<td>59</td>
<td>24</td>
<td>42</td>
<td>29%</td>
</tr>
<tr>
<td>Ministry of Defense</td>
<td>5</td>
<td>70</td>
<td>17</td>
<td>38</td>
<td>20%</td>
</tr>
<tr>
<td>Ministry Of Finance</td>
<td>5</td>
<td>62</td>
<td>26</td>
<td>37</td>
<td>30%</td>
</tr>
<tr>
<td>The civil service</td>
<td>5</td>
<td>69</td>
<td>21</td>
<td>35</td>
<td>23%</td>
</tr>
<tr>
<td>Ministry of Social Affairs and Labors</td>
<td>5</td>
<td>58</td>
<td>24</td>
<td>43</td>
<td>29%</td>
</tr>
<tr>
<td>Ministry of Higher Education</td>
<td>5</td>
<td>65</td>
<td>20</td>
<td>40</td>
<td>24%</td>
</tr>
<tr>
<td>Ministry of Education</td>
<td>5</td>
<td>59</td>
<td>14</td>
<td>52</td>
<td>19%</td>
</tr>
<tr>
<td>Kuwait Government Online</td>
<td>5</td>
<td>49</td>
<td>30</td>
<td>46</td>
<td>38%</td>
</tr>
</tbody>
</table>
Table 4-9 defines the Kuwaiti government sites in terms of how many pages were tested using WCAG 2.0 Level A. The table presents the total number of errors found, the total number of tests passed, and the criteria where the aligned coding features had not been implemented on the specific site, thus making the criteria unmeasurable during site testing. The table also presents all the errors and passes criteria that were recorded after calculation and the total passing percentages for the 25 criteria across the 10 Kuwaiti government websites.

Five pages from each of the 10 government sites were tested, with the highest passing percentage of 38% being found for the Kuwaiti government’s site. It had 49 total errors, 30 passes, and 46 criteria that were unmeasurable. The Ministry of Higher Education had a median passing percentage of 24% and the Civil Service Commission site scored 23%. The Ministry of Higher Education had 20 total passes, 65 errors, and 40 unmeasurable criteria. The Civil Service Commission site had 21 total passes, 69 errors, and 35 unmeasurable criteria. The lowest passing percentage came from the Ministry of Health, which scored 12% with 81 errors, 11 passes, and 33 unmeasurable criteria.

The highest number of errors was found for the Ministry of Health site, which had 81 errors, while the median numbers of errors were found for the General Secretariat of the Supreme Court with 68 errors and the Civil Service Commission with 69 errors. The lowest number of errors was found for the Kuwaiti government’s site, which had 49 errors.
Figure 4-19 shows the WCAG 2.0 Level A criteria passing percentage and the percentage of measurable criteria for the Kuwaiti government sites. The graph helps to understand various sites’ standings according to the applied WCAG 2.0 criteria. They reveal the quality of the sites and how effectively each one passed the criteria tests by comparing the passing percentages and the measurable criteria percentages.

The data reveals that the highest passing percentage was achieved by the Kuwaiti government’s site, which scored 63%. The median passing percentage was represented by the Ministry of Higher Education and the Civil Service Commission, which had 24% and 23%, respectively. The measurable criteria percentage rested at 68% for the Ministry of Higher Education and at 72% for the Civil Service Commission. The lowest passing percentage came from the Ministry of Health at 12%, with 74% of the criteria being measurable.
In terms of measurability, the Ministry of Health had the highest measurable criteria percentage of 74%, while the median positions were held by the Ministry of Higher Education at 68% and the Ministry of Social Affairs and Labour and the Ministry of Interior, both of which scored 66%. The lowest measurable criteria percentage came from the Ministry of Education site, which scored 58%.

The data presented above reveals information about the criteria passing percentages and the measurability of the sites with regard to the WCAG 2.0 Level A criteria. The results highlight how none of the sites had a high passing percentage, suggesting that there is room for more accessibility-related coding to be included. Most of the sites also had a fair amount of unmeasurable criteria, which emphasises the fact that accessibility-specific coding was not prioritised by developers when designing the sites.

Figure 4-20: Kuwaiti websites – average number of errors, passes, and unmeasurable criteria

Figure 4-20 shows the average number of errors, passes, and unmeasurable WCAG 2.0 Level A criteria for all the Kuwaiti sites. The average number of errors and passes reveals how many errors and passes were found on average and allows insights to be made concerning website
quality and accessibility with regard to the coding requirements implemented on a given site. Similarly, the average number of unmeasurable criteria relates to criteria where the coding features aligned to the specific WCAG criterion had not been implemented and thus could not be assessed.

The data in the graph reveals that the average number of errors, 64, ranked as the highest consideration. This was followed by the unmeasurable criteria, which averaged 41.3. The passing percentage ranked the lowest, with an average of 19.7 passes.

As evidenced by the findings of the graph, the Kuwaiti sites had the lowest number of passes, which emphasises the fact that accessibility-specific coding requirements for the sites were highly unsatisfactory. A significant amount of work needs to be done to make the Kuwaiti sites more accessible.

4.3.2 The UAE

<table>
<thead>
<tr>
<th>E-government</th>
<th>Total Pages</th>
<th>Total errors</th>
<th>Total Pass</th>
<th>N/A</th>
<th>Percentage of Pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Health</td>
<td>5</td>
<td>61</td>
<td>21</td>
<td>43</td>
<td>26%</td>
</tr>
<tr>
<td>Ministry of Social Affairs</td>
<td>5</td>
<td>63</td>
<td>24</td>
<td>38</td>
<td>28%</td>
</tr>
<tr>
<td>Ministry of labour</td>
<td>5</td>
<td>66</td>
<td>20</td>
<td>39</td>
<td>23%</td>
</tr>
<tr>
<td>Ministry of Interior</td>
<td>5</td>
<td>42</td>
<td>41</td>
<td>42</td>
<td>49%</td>
</tr>
<tr>
<td>Ministry Of Finance</td>
<td>5</td>
<td>58</td>
<td>30</td>
<td>37</td>
<td>34%</td>
</tr>
<tr>
<td>Ministry of Higher Education</td>
<td>5</td>
<td>59</td>
<td>28</td>
<td>38</td>
<td>32%</td>
</tr>
<tr>
<td>Ministry of Education</td>
<td>5</td>
<td>44</td>
<td>33</td>
<td>48</td>
<td>43%</td>
</tr>
<tr>
<td>UAE- Government Online</td>
<td>5</td>
<td>74</td>
<td>11</td>
<td>40</td>
<td>13%</td>
</tr>
<tr>
<td>UAE -Almajles National</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mygove uae</td>
<td>5</td>
<td>65</td>
<td>20</td>
<td>40</td>
<td>24%</td>
</tr>
</tbody>
</table>

Table 4-10 provides detailed information about the total number of passes, errors, and unmeasurable criteria for all the UAE government websites based on WCAG 2.0 Level A. The WCAG 2.0 tests were applied to five pages of each of the 10 government websites, revealing the quality of the different websites in terms of how efficient they were and how many.
passes, errors, and unmeasurable criteria they had. Moreover, the passing percentage for each website was calculated using the passing and error data.

According to Table 4-10, the Ministry of Interior had the highest passing percentage of 49% with 41 passes, 42 errors, and 42 unmeasurable criteria. The Ministries of Social Affairs and Health held the median passing percentages of 28% and 24%, respectively. The Ministry of Social Affairs had 24 passes, 63 errors, and 38 unmeasurable criteria. Similarly, the Ministry of Health had 21 passes, 61 errors, and 43 unmeasurable criteria. The lowest passing percentage came from the UAE government’s site, which scored only 13%, with only 11 passes, 74 errors, and 40 unmeasurable criteria.

In terms of errors, the UAE government’s site had the highest number with 74 errors. This was followed by the Ministry of Social Affairs with 63 errors and the Ministry of Health with 61 errors; they held the median position. The lowest number of errors came from the Ministry of Interior with 42 errors.

The data from Table 4-10 reveals that many errors were found on all the UAE government sites and that several criteria were unmeasurable. The passing percentages based on the measurable criteria were low for most of the sites, with even the highest percentage reflecting only half of the criteria being fulfilled. The data reveals how little attention is paid to accessible web design, evidenced by the low passing percentages and high numbers of errors.
Figure 4-21 reveals the measurable criteria percentages for different UAE government sites, along with the passing percentages for the WCAG 2.0 Level A criteria. The measurable criteria are those that have been applied to and assessed on the UAE government sites, while the passing percentage reveals the extent to which the criteria were applied on a given site. The graph can be analysed as an indicator of site quality by looking at every site individually in terms of passing percentage and measurable criteria percentage.

The highest passing percentage came from the Ministry of Interior site, which scored 49%, with 66% of the criteria being measurable. The median passing percentages came from the Ministry of Health at 26% and the Ministry of Social Affairs at 28%, while their measurable criteria percentages were 66% and 70%, respectively. The lowest passing percentage was 13% for the UAE government’s site, with 68% of the criteria being measurable.
In terms of measurability, the Ministries of Social Affairs, Finance, and Higher Education all scored the highest percentage of 70%. The median measurable criteria percentage was 68% from the UAE government’s site, the Al-Majles site, and the UAE’s MyGov site. The lowest measurable criteria percentage was 62% for the Ministry of Education site.

The data from Figure 4-21 reveals that all the government sites had many errors and several unmeasurable criteria. The passing percentages for the measurable criteria were low for most of the sites, with the highest percentage showing that only half of the criteria had passed. The data reflects how little accessibility is taken into account for web design on the sites, as there were low passing percentages and several documented errors.

**Figure 4-22: UAE websites – average number of errors, passes, and unmeasurable criteria**

Figure 4-22 shows the average number of errors, passes, and unmeasurable criteria across all the UAE sites based on WCAG 2.0 Level A. The information can be used to assess the overall quality of accessibility found in the web designs of the UAE government sites, offering insight on how accessibility-specific sites are designed.
The data on the graph reveals that the average number of errors is 59.9, while the median average was held by the unmeasurable criteria at 40.5. The lowest average was for the total number of passes, 24.6 per site.

The graph clearly shows that the number of errors found on the government sites was immense, with several accessibility-related criteria not being well aligned with WCAG 2.0 Level A criteria. Thus, the criteria were not implemented and could not be checked or tested. The average passing percentage for the UAE government sites was low, indicating that accessibility was considered only to the extent that was necessary for web design.

### 4.3.3 Qatar

**Table 4-11: Qatari websites – ranking**

<table>
<thead>
<tr>
<th>E-government</th>
<th>Total Pages</th>
<th>Total errors</th>
<th>Total Pass</th>
<th>N/A</th>
<th>Percentage of Pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qatar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ministry of Health</td>
<td>5</td>
<td>24</td>
<td>47</td>
<td>54</td>
<td>66%</td>
</tr>
<tr>
<td>Ministry of Social Affairs and Labors</td>
<td>5</td>
<td>52</td>
<td>31</td>
<td>42</td>
<td>37%</td>
</tr>
<tr>
<td>Ministry of Interior</td>
<td>5</td>
<td>58</td>
<td>30</td>
<td>37</td>
<td>34%</td>
</tr>
<tr>
<td>Qatar tourism Authority</td>
<td>5</td>
<td>57</td>
<td>35</td>
<td>33</td>
<td>38%</td>
</tr>
<tr>
<td>Ministry of Foreign Affairs</td>
<td>5</td>
<td>46</td>
<td>38</td>
<td>41</td>
<td>45%</td>
</tr>
<tr>
<td>Ministry of Higher Education</td>
<td>5</td>
<td>62</td>
<td>23</td>
<td>40</td>
<td>27%</td>
</tr>
<tr>
<td>Ministry of Education</td>
<td>5</td>
<td>38</td>
<td>42</td>
<td>45</td>
<td>53%</td>
</tr>
<tr>
<td>Qatar Government Online</td>
<td>5</td>
<td>26</td>
<td>56</td>
<td>43</td>
<td>68%</td>
</tr>
<tr>
<td>The Ministry of Public Works</td>
<td>5</td>
<td>42</td>
<td>39</td>
<td>44</td>
<td>48%</td>
</tr>
<tr>
<td>Ministry of Information and Communications Tech</td>
<td>5</td>
<td>21</td>
<td>54</td>
<td>50</td>
<td>72%</td>
</tr>
</tbody>
</table>

Table 4-11 shows the total number of errors, passes, and unmeasurable criteria for each Qatari site, along with the passing percentage for every site based on WCAG 2.0 Level A. The graph details five pages of each of the 10 Qatari government sites and reveals the total number of errors and unmeasurable criteria found on the sites. The table also emphasises the
number of passes for each site to help explain the actual application of accessibility-related criteria on the sites.

The Ministry of Communication had the highest passing percentage of 72% with 54 passes, 21 errors, and 50 unmeasurable criteria. The Public Works Authority scored a 48% passing percentage and the Ministry of Foreign Affairs scored 45%; they represented the median passing percentages. The Public Works Authority had 42 errors, 39 passes, and 44 unmeasurable criteria. Similarly, the Ministry of Foreign Affairs had 46 errors, 38 passes, and 41 unmeasurable criteria.

The highest number of errors, 62, was recorded by the Ministry of Higher Education. The median numbers of errors came from the Ministry of Foreign Affairs at 46 and the Public Works Authority at 42. The lowest number of errors, 21, was scored by the Ministry of Communication.

Figure 4-23: Qatari websites – criteria passing percentage and percentage of measurable criteria by government website
Figure 4-23 shows the WCAG 2.0 Level A criteria passing percentage and the percentage of measurable criteria for the different government sites of Qatar. The results in the graph shed light on the quality of each site by exploring the websites in terms of passing percentages and measurable criteria.

The highest passing percentage came from the Ministry of Communication at 72%, whereas the site’s measurable criteria percentage was 60%. The median passing percentages were 48% for the Public Works Authority and 45% for the Ministry of Foreign Affairs. The measurable criteria percentages for these two sites were 65% and 67%, respectively. The lowest passing percentage of 27% belonged to the Ministry of Higher Education, with 68% of the criteria being measurable.

In terms of measurability, the highest percentage was 74% for the Qatar Tourism Authority, which had a passing percentage of 38%. The median measurable criteria percentage belonged to the Ministry of Social Affairs and Labour and the Qatari government’s site, both of which scored 66% with passing percentages of 37% and 68%, respectively. The lowest measurable criteria percentage came from the Ministry of Health at 57%, with a passing percentage of 66%.

The graph clearly indicates that although some websites had a high percentage of measurable criteria, their passing percentages were quite mixed. While some sites had a comparatively high passing percentage, others had very low percentages. This indicates that the accessibility-related features present on the sites resulted from web design activities. They occurred as the result of overlap between design and accessibility requirements.
Figure 4-24 indicates the average number of errors, passes, and measurable WCAG 2.0 Level A criteria for the Qatari government sites that were studied. The graph can be used to assess the overall accessibility situation of the Qatari sites in terms of how many errors each site had, how many passes each site managed to procure on average, and how many criteria were unmeasurable on average. This information can be used to assess the quality of the government sites.

Figure 4-24 shows the highest average for unmeasurable criteria at 42.9. The median average was the number of errors at 42.6 per site. The lowest average recorded was for the number of passes at 39.5.

The data in the graph reveals that a high percentage of criteria were unmeasurable, with the majority of measurable criteria having errors. The average number of passes per site indicates the lack of proper accessibility-based design considerations for the Qatari government websites.
4.3.4 Overall: Kuwait, the UAE, and Qatar

Table 4-12: Kuwaiti, UAE, and Qatari websites – ranking

<table>
<thead>
<tr>
<th>Country</th>
<th>Total Pages</th>
<th>Total errors</th>
<th>Total Pass</th>
<th>Total NA</th>
<th>Percentage of Pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kuwait</td>
<td>50</td>
<td>640</td>
<td>197</td>
<td>413</td>
<td>24%</td>
</tr>
<tr>
<td>UAE</td>
<td>50</td>
<td>599</td>
<td>246</td>
<td>405</td>
<td>29%</td>
</tr>
<tr>
<td>QATAR</td>
<td>50</td>
<td>426</td>
<td>395</td>
<td>429</td>
<td>48%</td>
</tr>
</tbody>
</table>

Table 4-12 shows the overall total number of errors, passes, and unmeasurable criteria for all the government sites of Kuwait, the UAE, and Qatar based on WCAG 2.0 Level A. The number of errors, passes, and unmeasurable criteria in the table are compiled from the results of tests done on 50 pages in total (five pages from 10 sites per country). The tests examined how 25 WCAG 2.0 level A criteria were tested, applied, and implemented.

The highest passing percentage came from the Qatari government sites at 48%, with 426 total errors, 395 total passes, and 429 unmeasurable criteria. The UAE government sites had the median passing percentage of 29%, with 599 total errors, 246 total passes, and 405 unmeasurable criteria. The lowest passing percentage belonged to the Kuwaiti government sites, which had 640 errors, 197 passes, and 413 unmeasurable criteria due to their lack of implementation on the studied websites.

Figure 4-25: Kuwaiti, UAE, and Qatari websites – criteria passing percentage and percentage of measurable criteria
Figure 4-25 shows the overall WCAG 2.0 Level A criteria passing percentages and percentage of measurable criteria for all the government sites of Kuwait, the UAE, and Qatar. The graph presents the overall situation regarding the criteria being tested, applied, and implemented on the sites. This information can be used to assess the overall quality of the government sites and can comparatively show which country’s sites offer better accessibility-related web design features.

In terms of passing percentages, the Qatari sites scored the highest percentage of 48%, with 66% of the criteria being measurable. The UAE sites held the median passing percentage position at 29%, and 68% of the criteria were measurable. The lowest passing percentage came from the Kuwaiti sites at 24%, with a measurable criteria percentage of 67%.

In terms of measurability, the UAE sites were the most measurable with a passing percentage of 29%. The median measurable criteria percentage came from the Kuwaiti sites with a passing percentage of 24%. Qatari sites experienced the lowest level of measurability at 66%, but they still had a highest passing percentage of 48%.

The graph clearly shows how the Qatari sites performed better comparatively, as they had a high passing percentage and a comparatively low measurable criteria percentage. Even though the passing percentages for all three countries were low in comparison to the number of errors they registered, the Qatari sites still showed the best results. However, accessibility-related criteria were not well satisfied in any of the three countries’ sites; the only criteria implemented were the ones that were considered essential in the web design process or were implemented by accident.
Figure 4-26 reveals the passing percentages for five ministries of the three countries based on WCAG 2.0 Level A. The graph offers insights on the five ministries and shows which ministries’ sites yielded better web accessibility-related performance compared to the others.

As far as the Ministry of Public Health is concerned, the Qatari site had the highest passing percentage of 66%, while the UAE Ministry of Health had the median passing percentage of 26%. The Kuwaiti Ministry of Health had the lowest score of 12%.

The Ministry of Social Affairs and Labour for Qatar had the highest passing percentage of 37%, while Kuwait had the median passing percentage of 29%. The UAE had the lowest passing percentage of 28%. As a whole, the three countries had relatively low passing percentages.
The UAE had the highest passing percentage at 49% for its Ministry of Interior, followed by the Qatari site, which had the median passing percentage of 34%. The lowest passing percentage came from the Kuwaiti site with a score of 29%.

The UAE had the highest passing percentage of 32% for its Ministry of Higher Education, while the median passing percentage came from the Qatari Ministry of Higher Education at 27%. The lowest passing percentage was 24% for the Kuwaiti Ministry of Higher Education. Again, all of these passing percentages were relatively low.

Qatar had the highest passing percentage of 53% for its Ministry of Education, whereas the median passing percentage of 43% came from the UAE Education site. The lowest passing percentage came from the Kuwaiti Ministry of Education at 19%.

In terms of passing percentages, the Qatari sites scored the highest collective figures. The country with the median collective passing percentages was the UAE, while the Kuwaiti sites had the lowest passing percentages.

The passing percentages of the three countries’ sites reveal that accessibility-related coding features were scarce on almost all the sites. The low passing percentages mean that only necessary or unavoidable accessibility-related coding was performed on the various sites. The graph highlights which ministries had the most accessibility-related criteria implemented.
Figure 4-27: Kuwaiti, UAE, and Qatari websites – average number of errors, passes, and unmeasurable criteria

Figure 4-27 reveals the average number of errors, passes, and unmeasurable criteria on all the Kuwaiti, UAE, and Qatari sites studied based on WCAG 2.0 Level A. The graph explores the overall situation for the sites by assessing the average number of errors, passes, and unmeasurable criteria.

The highest average was for the total number of errors at 555 errors per country, while the median average came from the unmeasurable criteria at 415.7. The lowest average came from the total number of passes at 279.3.

The graph clearly indicates that the total number of passes on the sites for all the countries was very low and a lot of errors were recorded. This reveals that the web accessibility features on the sites were insufficient and most likely resulted from unavoidable design. No special effort related to web accessibility was made in the design of the websites.
Figure 4-28 presents a comparison of the average number of errors, passes, and unmeasurable criteria for the three countries using WCAG 2.0 Level A. The graph sheds light on the sites’ accessibility-related features with regard to the average number of errors, passes, and unmeasurable criteria.

In terms of total errors, the Kuwaiti sites had the highest average, at 64 per site, while the median number of errors came from the UAE sites, at 59.9 errors. The lowest average number of errors came from the Qatari sites, with an average of 42.6 errors per site.

In terms of the total average number of passes, the Qatari sites had the highest score of 39.5, followed by the median score of 24.6 from the UAE sites. The lowest average number of passes came from the Kuwaiti sites, which recorded 19.7 passes on average per site.

The average for unmeasurable criteria was almost the same for all the sites across the three countries, with the highest score of 42.9 coming from the Qatari sites. The median average
for unmeasurable criteria came from the Kuwaiti sites with an average of 41.3. The lowest average was for the UAE sites, which had an average of 40.5 criteria being unmeasurable.

Collectively, it can be calculated after analysis of the graph that the average number of total errors was the highest measure on all the sites for the three countries, followed by the unmeasurable criteria average, which held the median position. The total average number of passes was the lowest measure for all the countries’ sites.

The graph clearly shows that many errors were experienced on all the sites, with many of the criteria not being implemented on the sites altogether; this was reflected in the very low average number of passes. Therefore, it is likely that no significant effort has been put forth for web accessibility on any of the government sites and that more attention is needed in this area.
4.4 Testing Common Pages, the Main Page, and the ‘Contact Us’ Page

4.4.1 Kuwait

Table 4-13: Kuwaiti websites – ranking the main and Contact Us pages

<table>
<thead>
<tr>
<th>E-government</th>
<th>Total errors</th>
<th>Total Pass N/A</th>
<th>Percentage of Pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kuwait</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ministry of Health</td>
<td>Main Page</td>
<td>18</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Contact Us</td>
<td>16</td>
<td>2</td>
</tr>
<tr>
<td>General Secretariat of the Supreme Council</td>
<td>Main Page</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Contact Us</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>Ministry of Interior</td>
<td>Main Page</td>
<td>14</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Contact Us</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td>Ministry of Defense</td>
<td>Main Page</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Contact Us</td>
<td>15</td>
<td>3</td>
</tr>
<tr>
<td>Ministry Of Finance</td>
<td>Main Page</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Contact Us</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>The civil service</td>
<td>Main Page</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Contact Us</td>
<td>15</td>
<td>3</td>
</tr>
<tr>
<td>Ministry of Social Affairs and Labor</td>
<td>Main Page</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Contact Us</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>Ministry of Higher Education</td>
<td>Main Page</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Contact Us</td>
<td>13</td>
<td>4</td>
</tr>
<tr>
<td>Ministry of Education</td>
<td>Main Page</td>
<td>11</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Contact Us</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>Kuwait Government Online</td>
<td>Main Page</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Contact Us</td>
<td>10</td>
<td>7</td>
</tr>
</tbody>
</table>

Table 4-13 summarises the results of the WCAG 2.0 Level A tests that were applied to the main and Contact Us pages of 10 Kuwaiti government sites. The table reveals the total number of errors, passes, and unmeasurable criteria found on two pages from each site, along with the total passing percentage achieved by each site based on the 25 tests conducted.

The results reveal that the Kuwaiti government’s site has the highest passing percentages, with 35% for the main page and 41% for the Contact Us page. In terms of main page passing percentage, the median percentage came from the Ministries of Defence and Higher Education, as well as the Civil Service Commission, all of which had a 22% passing percentage. The lowest passing percentage came from the main page of the General Secretariat of the Supreme Council, which had a score of only 6%.
In terms of the Contact Us page, as mentioned earlier, the Kuwaiti government’s site ranked highest with a 41% passing percentage, followed by the Ministry of Interior with a median passing percentage of 22% on its Contact Us page. The lowest passing percentage came from the Ministry of Health at 11%.

In terms of errors on the main and Contact Us pages of the sites, the Ministry of Health had the highest total, with 18 errors on its main page and 16 errors on its Contact Us page. The General Secretariat of the Supreme Council, the Ministry of Defence, and the Civil Service Commission had the median total number of errors. The Ministry of Interior and the Civil Service Commission both recorded 14 errors on their main pages and 15 errors on their Contact Us pages, while the General Secretariat of the Supreme Court had 15 errors on its main page and 14 errors on the Contact Us page. The lowest total number of errors came from the Kuwaiti government’s site, which had 11 errors on its main page and 10 errors on its Contact Us page.

In terms of unmeasurable criteria, the highest number came from the Ministry of Education, with 11 unmeasurable criteria on its main page and 12 unmeasurable criteria on its Contact Us page. The Ministry of Higher Education and the Civil Service Commission had the median numbers. The Ministry of Higher Education had seven and eight errors on its main and Contact Us pages, respectively, whereas the Civil Service Commission had seven unmeasurable criteria on both pages. The lowest numbers came from the Ministries of Health and Finance, with five unmeasurable criteria on the main page and seven on the Contact Us page of the Ministry of Health, along with four and eight unmeasurable criteria, respectively, for the Finance Ministry’s main and Contact Us pages.
Figure 4-29 shows the WCAG 2.0 Level A criteria passing percentages and percentage of measurable criteria for the main pages of Kuwaiti government sites. All 25 criteria were tested on the 10 sites’ main pages and offered insights into the site quality through comparisons of the passing and measurable criteria percentages.

The highest passing percentage was seen on the main page for the Kuwaiti government’s site at 35%, while the median passing percentages came from the Ministries of Defence and Higher Education, as well as the Civil Service Commission, all with a score of 22%. The lowest passing percentage of 6% came from the General Secretariat of the Supreme Council.

In terms of measurability, the highest percentage of 84% came from the Ministry of Finance, whereas the median score of 72% came from the Ministries of Defence, Social Affairs and Labour, and Higher Education, as well as the Civil Service Commission. The lowest percentage came from the Ministry of Education at 56%.
As evidenced by the statistics, even though a majority of the criteria were measurable on all the Kuwaiti government sites, their passing percentages were rather low for the main pages. Even the highest passing percentage was not enough to suggest that accessibility features had been included on the main pages. It is likely that there is a serious lack of accessibility-related features being included by website developers.

Figure 4-30: Kuwaiti websites – criteria passing percentage and percentage of measurable criteria on Contact Us pages

Figure 4-30 shows the criteria passing percentages and measurable criteria percentages for all the Contact Us pages of Kuwaiti government sites based on WCAG 2.0 Level A tests. The graph helps to demonstrate the quality of the Contact Us pages by comparing the criteria passing percentages and the percentage of measurable criteria.

The highest passing percentage for a Kuwaiti government site’s Contact Us page was found to be the Kuwaiti government’s site at 41%. The median passing percentage came from the
Ministry of Interior with a score of 22%, whereas the lowest passing percentage came from the Ministry of Health at 11%.

In terms of measurability, the Ministries of Health, Interior, and Defence, as well as the Civil Service Commission, were 72% measurable. One median percentage of 68% came from the Ministries of Finance and Higher Education, whereas another median figure of 64% came from the General Secretariat of the Supreme Court and the Ministry of Social Affairs and Labour. The lowest percentage came from the Ministry of Education at 52%.

The data depicted in the graph clearly shows how, even though the measurable criteria percentages were comparatively higher for the Contact Us pages, their passing percentages were unsatisfactory. This indicates that web accessibility was not the foremost concern when developers were coding the sites, which is why almost all the sites lack accessibility-related coding features.

Figure 4-31: Kuwaiti websites – average number of errors, passes, and unmeasurable criteria on main and Contact Us pages

![Graph showing average number of errors, passes, and unmeasurable criteria for Kuwaiti websites.]

Figure 4-31 explains the average number of errors, passes, and unmeasurable WCAG 2.0 Level A criteria for the main and Contact Us pages of the Kuwaiti government sites. The graph allows
for the interpretation of Main and Contact Us page quality by defining how many errors and passes were found, as well as the number of unmeasurable criteria.

The graph reveals that the number of errors possessed the highest average on all the main or Contact Us pages, with 13.55 errors on every main and Contact Us page. The median average came from the unmeasurable criteria, which indicated that 7.65 criteria were not aligned with WCAG 2.0. The lowest average was the number of passes, at 3.8 passes on the main and Contact Us pages.

The data revealed in the graph clearly explains that errors were found in abundance on all the main and Contact Us pages. Thus, accessibility-related coding was likely not applied during the web design process. Also, the amount of unmeasurable criteria suggests a lack of accessibility features, while the very low average number of passes on all the main pages further supports the assertion that none of the Kuwaiti government main pages were designed with accessibility-specific features in mind.
4.4.2 The UAE

Table 4-14: UAE websites – ranking the main page and Contact Us pages

<table>
<thead>
<tr>
<th>E-government</th>
<th>Total errors</th>
<th>Total Pass</th>
<th>N/A</th>
<th>Percentage of Pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>UAE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ministry of Health</td>
<td>Main Page 13</td>
<td>6</td>
<td>9</td>
<td>19%</td>
</tr>
<tr>
<td></td>
<td>Contact Us 12</td>
<td>4</td>
<td>9</td>
<td>25%</td>
</tr>
<tr>
<td>Ministry of Social Affairs</td>
<td>Main Page 13</td>
<td>6</td>
<td>6</td>
<td>32%</td>
</tr>
<tr>
<td></td>
<td>Contact Us 12</td>
<td>6</td>
<td>7</td>
<td>33%</td>
</tr>
<tr>
<td>Ministry of labour</td>
<td>Main Page 14</td>
<td>5</td>
<td>6</td>
<td>26%</td>
</tr>
<tr>
<td></td>
<td>Contact Us 12</td>
<td>5</td>
<td>8</td>
<td>29%</td>
</tr>
<tr>
<td>Ministry of Interior</td>
<td>Main Page 11</td>
<td>6</td>
<td>8</td>
<td>35%</td>
</tr>
<tr>
<td></td>
<td>Contact Us 12</td>
<td>6</td>
<td>7</td>
<td>33%</td>
</tr>
<tr>
<td>Ministry Of Finance</td>
<td>Main Page 12</td>
<td>5</td>
<td>8</td>
<td>29%</td>
</tr>
<tr>
<td></td>
<td>Contact Us 12</td>
<td>6</td>
<td>7</td>
<td>33%</td>
</tr>
<tr>
<td>Ministry of Higher Education</td>
<td>Main Page 10</td>
<td>7</td>
<td>8</td>
<td>41%</td>
</tr>
<tr>
<td></td>
<td>Contact Us 10</td>
<td>7</td>
<td>8</td>
<td>41%</td>
</tr>
<tr>
<td>UAE- Government Online</td>
<td>Main Page 13</td>
<td>1</td>
<td>11</td>
<td>7%</td>
</tr>
<tr>
<td></td>
<td>Contact Us 14</td>
<td>4</td>
<td>8</td>
<td>18%</td>
</tr>
<tr>
<td>UAE - Almajles National</td>
<td>Main Page 15</td>
<td>2</td>
<td>8</td>
<td>12%</td>
</tr>
<tr>
<td></td>
<td>Contact Us 13</td>
<td>4</td>
<td>8</td>
<td>24%</td>
</tr>
<tr>
<td>mygove uae</td>
<td>Main Page 13</td>
<td>4</td>
<td>8</td>
<td>24%</td>
</tr>
<tr>
<td></td>
<td>Contact Us 13</td>
<td>4</td>
<td>8</td>
<td>24%</td>
</tr>
</tbody>
</table>

Table 4-14 shows the total passing percentage, as well as the total number of errors, passes, and unmeasurable criteria for the main and Contact Us pages of all the UAE government sites. The tests were performed using WCAG 2.0 Level A criteria.

The highest main page passing percentage of 50% came from the Ministry of Interior, while the median passing percentages came from the Ministry of Higher Education at 29% and the Ministry of Labour at 26%. The lowest passing percentage of 7% came from the UAE government’s site. For the Contact Us pages, the Ministry of Education had the highest passing percentage of 41%, followed by the median passing percentage of 29% from the
Ministry of Labour. The lowest passing percentage belonged to the UAE government’s site at 18%.

Considering the total number of passes received, the Ministry of Interior had the highest number with nine for its main page and six for its Contact Us page. Median figures came from the Ministry of Labour with five passes on each page. The lowest number of passes belonged to the UAE government’s site, which had one pass on its main page and three passes on its Contact Us page.

Table 4-14 also reveals the total number of errors found on the two pages of the various UAE government sites. The Al-Majles site had the highest number of errors, with 15 on its main page and 13 errors on its Contact Us page. Median error numbers came from the Ministries of Health and Social Affairs, with 13 errors on their main pages and 12 errors on their Contact Us pages. The lowest number of errors came from the Ministry of Education, which had 10 errors on both of its pages.

Along with the passing percentages and the number of passes and errors, the table also sheds light on the number of unmeasurable criteria found on all the sites’ main pages. The highest number in this regard came from the UAE government’s site, which had 11 unmeasurable criteria on its main page and eight on its Contact Us page. The median figures came from the Ministries of Finance and Higher Education, both of which had eight unmeasurable criteria on their main pages and seven on their Contact Us pages. In contrast, the Ministry of Education, the Al-Majles site, and the UAE’s MyGov site all had eight errors on both their main and Contact Us pages. The lowest number of unmeasurable criteria came from the Ministry of Social Affairs, which had six unmeasurable criteria on its main page and seven on its Contact Us page.
Figure 4-32: UAE websites – criteria passing percentage and percentage of measurable criteria on main pages

Figure 4-32 shows the passing percentages and percentage of measurable criteria for the main pages of all the UAE government’s sites based on WCAG 2.0 Level A. The graph can be used to interpret the quality of the sites by comparing the measurable criteria and the passing percentages for each site’s main page.

The highest passing percentage came from the Ministry of Interior, which had a 50% passing percentage for its main page, whereas the median passing percentages belonged to the Ministry of Labour and the Ministry of Higher Education, which had passing percentages of 26% and 29%, respectively. The lowest passing percentage of 7% came from the main page of the UAE government’s site.
In terms of measurability, the Ministries of Social Affairs and Labour had the highest percentage of 76% on their main pages. The Ministries of Finance, Education, and Higher Education had the median percentage of 68%. The lowest measurable criteria percentage came from the UAE government’s site, which was 56% measurable.

The data presented in the graph supports the argument that even though the measurable criteria on all the sites was high, their passing percentages were quite low. Thus, there is little evidence of accessibility factors being considered during the website design process.

Figure 4-33: UAE websites – criteria passing percentage and percentage of measurable criteria on Contact Us pages

Figure 4-33 depicts the passing percentages and percentage of measurable criteria found on the Contact Us pages of the UAE government sites based on WCAG 2.0 Level A. The graph offers insights on the quality of the Contact Us pages by comparing the measurable criteria and passing percentages of the sites.
The data found in the graph shows that the highest passing percentage belonged to the Ministry of Education at 41%, followed by the Ministry of Labour with the median passing percentage of 29%. The lowest passing percentage came from the UAE government’s site, which had an 18% passing percentage.

In terms of measurability, the Ministries of Social Affairs, Interior, Finance, and Higher Education all logged the highest percentage of 72% measurability. The median figure came from the Ministries of Labour and Education, as well as the UAE government’s site, the Al-Majles site, and the UAE’s MyGov site, all of which had 68% measurability for their Contact Us pages. The lowest measurable criteria percentage came from the Ministry of Health with a score of 64%.

The data in the graph clearly indicates that even though the measurable criteria percentages were high for every site, the passing percentages were rather low. This suggests that proper accessibility-related coding was not implemented by site developers. The fact that even the site with the highest passing percentage could not pass a decent number of tests highlights how little accessibility was considered during the web design process.

Figure 4-34: UAE websites – average number of errors, passes, and unmeasurable criteria on main and Contact Us pages
Figure 4-34 shows the average number of errors, passes, and unmeasurable criteria found on the main and Contact Us pages of all the UAE government sites based on WCAG 2.0 Level A. The graph offers a clear picture of the average number of errors, passes, and unmeasurable criteria, providing a clear picture of site quality.

The graph reveals that the average number of errors found on the main and Contact Us pages was the highest figure, with 12.25 errors on every site. The median average of 7.8 was held by the number of unmeasurable criteria per site. The average number of passes had the lowest figure of 4.95.

The graph’s data clearly indicates that the number of errors and unmeasurable criteria were higher than the number of passes for the pages. This means that accessibility-related coding features were not implemented on the main and Contact Us pages of the UAE government sites.
4.4.3 Qatar
Table 4-15: Qatari websites – ranking the Main and Contact Us pages

<table>
<thead>
<tr>
<th>E-government</th>
<th>Total errors</th>
<th>Total Pass</th>
<th>N/A</th>
<th>Percentage of Pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qatar</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ministry of Health</td>
<td>Main Page 6</td>
<td>9</td>
<td>8</td>
<td>65%</td>
</tr>
<tr>
<td></td>
<td>Contact Us 7</td>
<td>9</td>
<td>8</td>
<td>53%</td>
</tr>
<tr>
<td>Ministry of Social Affairs and</td>
<td>Main Page 12</td>
<td>4</td>
<td>9</td>
<td>25%</td>
</tr>
<tr>
<td>Labor</td>
<td>Contact Us 12</td>
<td>4</td>
<td>9</td>
<td>25%</td>
</tr>
<tr>
<td>Ministry of Interior</td>
<td>Main Page 14</td>
<td>5</td>
<td>6</td>
<td>26%</td>
</tr>
<tr>
<td></td>
<td>Contact Us 14</td>
<td>5</td>
<td>6</td>
<td>26%</td>
</tr>
<tr>
<td>Qatar tourism Authority</td>
<td>Main Page 11</td>
<td>7</td>
<td>7</td>
<td>39%</td>
</tr>
<tr>
<td></td>
<td>Contact Us 10</td>
<td>8</td>
<td>7</td>
<td>44%</td>
</tr>
<tr>
<td>Ministry of Foreign Affairs</td>
<td>Main Page 9</td>
<td>6</td>
<td>10</td>
<td>40%</td>
</tr>
<tr>
<td></td>
<td>Contact Us 10</td>
<td>8</td>
<td>7</td>
<td>44%</td>
</tr>
<tr>
<td>Ministry of Higher Education</td>
<td>Main Page 15</td>
<td>4</td>
<td>6</td>
<td>21%</td>
</tr>
<tr>
<td></td>
<td>Contact Us 13</td>
<td>4</td>
<td>8</td>
<td>24%</td>
</tr>
<tr>
<td>Ministry of Education</td>
<td>Main Page 6</td>
<td>9</td>
<td>10</td>
<td>60%</td>
</tr>
<tr>
<td></td>
<td>Contact Us 9</td>
<td>8</td>
<td>10</td>
<td>47%</td>
</tr>
<tr>
<td>Qatar Government Online</td>
<td>Main Page 6</td>
<td>10</td>
<td>9</td>
<td>63%</td>
</tr>
<tr>
<td></td>
<td>Contact Us 4</td>
<td>12</td>
<td>9</td>
<td>75%</td>
</tr>
<tr>
<td>The Ministry of Public Works</td>
<td>Main Page 7</td>
<td>9</td>
<td>9</td>
<td>56%</td>
</tr>
<tr>
<td></td>
<td>Contact Us 9</td>
<td>5</td>
<td>11</td>
<td>36%</td>
</tr>
<tr>
<td>Ministry of Information and</td>
<td>Main Page 5</td>
<td>10</td>
<td>10</td>
<td>67%</td>
</tr>
<tr>
<td>Communications Tech</td>
<td>Contact Us 4</td>
<td>11</td>
<td>10</td>
<td>73%</td>
</tr>
</tbody>
</table>

Table 4-15 shows the total number of errors, passes, and unmeasurable criteria along with the passing percentages for the main and Contact Us pages of the Qatari government sites.

The results were derived after implementing criteria based on WCAG 2.0 Level A.

The table reveals that the highest main page passing percentage came from the Ministry of Communication at 67%, whereas the median passing percentage came from the Ministry of Foreign Affairs at 40% and the Public Works Authority at 56%. In terms of the Contact Us pages, the highest passing percentage was found on the Qatari government’s site at 75%. The median passing percentage came from the Qatar Tourism Authority and the Ministry of
Foreign Affairs, both of which had a score of 44%. The lowest passing percentage belonged to the Ministry of Higher Education at 24%.

The highest total number of passes was logged for the Qatari government’s site, with 10 passes on its main page and 12 on its Contact Us page. The Qatar Tourism Authority had the median number of passes with seven for its main page and eight for its Contact Us page. The lowest number of passes came from the Ministry of Labour and Social Affairs and the Ministry of Higher Education, with four passes found on both pages for both of the ministries.

The highest number of total errors came from the Ministry of Interior and the Ministry of Education and Higher Education, with the Ministry of Interior having 14 errors on both its pages and the Ministry of Education and Higher Education having 15 errors on its main page and 13 errors on its Contact Us page. The Public Works Authority and the Ministry of Foreign Affairs had the median number of errors, with seven errors on the main page and nine on the Contact Us page for the Public Works Authority, and nine errors on the main page and 10 on the Contact Us page for the Ministry of Foreign Affairs.

The highest number of unmeasurable criteria came from the Public Works Authority and the Ministry of Communication. The Public Works Authority had nine unmeasurable criteria on its main page and 11 unmeasurable criteria on its Contact Us page. The Ministry of Communication had 10 unmeasurable criteria on both of its pages. The Ministry of Foreign Affairs held the median figure, with 10 criteria being unmeasurable on its main page and seven unmeasurable criteria on its Contact Us page. The lowest number of unmeasurable criteria came from the Ministry of Interior, where both pages had six errors.
According to the graph, the Ministry of Health had the highest passing percentage of 65%, followed by the median passing percentages of 40% and 56% for the Ministry of Social Affairs and the Public Works Authority, respectively. The lowest passing percentage came from the Ministry of Higher Education at 21%.

In terms of measurability, the Qatar Tourism Authority and the Ministry of Higher Education had the highest percentage of 76%, whereas the median percentage came from the Ministry of Public Health, with 68% of its criteria being measurable. The lowest measurable criteria
percentage belonged to the Ministries of Foreign Affairs, Communication, and Education, with all three having a score of 60%.

The data in the graph shows that the passing percentages for several criteria were high. This indicates the extent to which accessibility-related coding was applied on the Qatari sites. There was mostly a positive outcome, but the measurable criteria percentage found for some of the sites was as low as 60% (for the Ministry of Communication), suggesting that the site’s coding features were more design-specific than accessibility-focused.

Figure 4-36: Qatari websites – criteria passing percentage and percentage of measurable criteria on Contact Us pages

Figure 4-36 reveals the passing and measurable criteria percentages found on the Contact Us pages of the Qatari government sites based on WCAG 2.0 Level A. The graph offers a realistic picture that can help reveal the quality of the Qatari Government’s Contact Us pages.
According to the graph, the highest passing percentage came from the Qatari government’s site with a score of 75%. The median passing percentage belonged to the Qatar Tourism Authority and the Ministry of Foreign Affairs, which both scored 44%. The lowest passing percentage came from the Ministry of Higher Education, with a passing percentage of 24%.

In terms of measurability, the Ministry of Interior had the highest percentage at 76%, followed by the median percentage at 60% for the Ministry of Communication. The lowest measurable criteria percentage came from the Public Works Authority at 56%.

The graph provides more data that stresses the lack of web accessibility considerations in the web design of the Qatari sites. The passing percentages for the Qatari sites are relatively higher than the percentages for Kuwait and the UAE; however, some sites show a low passing percentage. The fluctuating passing percentages may be the result of accessibility-related criteria not being implemented consistently across the sites.

Figure 4-37: Qatari websites – average number of errors, passes, and unmeasurable criteria on main and Contact Us pages

![Figure 4-37: Qatari websites – average number of errors, passes, and unmeasurable criteria on main and Contact Us pages](image)

Figure 4-37 reveals the average number of errors, passes, and unmeasurable criteria found on all the main and Contact Us pages of the Qatari government websites based on WCAG 2.0
Level A. The graph provides an overall picture of the average number of errors, passes, and unmeasurable criteria, thus defining site quality for the selected pages.

The graph reveals that the total average number of errors had the highest figure with an average of 9.15 errors found per page. The median average was held by unmeasurable criteria, with every site having 8.35 criteria that were not assessed or implemented. The lowest figure was for the number of passes found on every site, with an average of 7.45 passes per site.

The data revealed through the graph clearly expresses that amidst the unmeasurable criteria and errors found across the various site pages, the average number of passes may be the result of typical web design practices. Thus, these three countries in this research are not indicative of any accessibility-related features being applied on the sites.

4.4.4 Overall: Kuwait, the UAE, and Qatar

Table 4-16: Kuwaiti, UAE, and Qatari websites – ranking the Main and Contact Us pages

<table>
<thead>
<tr>
<th></th>
<th>Total errors</th>
<th>Total Pass</th>
<th>N/A</th>
<th>Percentage of Pass</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Kuwait</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main Page</td>
<td>140</td>
<td>39</td>
<td>71</td>
<td>22%</td>
</tr>
<tr>
<td>Contact Us</td>
<td>131</td>
<td>37</td>
<td>82</td>
<td>22%</td>
</tr>
<tr>
<td><strong>UAE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main Page</td>
<td>123</td>
<td>48</td>
<td>79</td>
<td>28%</td>
</tr>
<tr>
<td>Contact Us</td>
<td>122</td>
<td>51</td>
<td>77</td>
<td>29%</td>
</tr>
<tr>
<td><strong>QATAR</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main Page</td>
<td>91</td>
<td>75</td>
<td>84</td>
<td>45%</td>
</tr>
<tr>
<td>Contact Us</td>
<td>92</td>
<td>74</td>
<td>83</td>
<td>44%</td>
</tr>
</tbody>
</table>

Table 4-16 reveals the total number of errors, passes, and unmeasurable criteria along with the passing percentages for the main and Contact Us pages of the Kuwaiti, UAE, and Qatari sites being studied. This assessment was performed through the application of WCAG 2.0 Level A.
The table shows that the highest passing percentages for the main and Contact Us pages belonged to the Qatari sites, which passed with scores of 45% and 44%, respectively. The median passing percentage came from the UAE sites, whereas the lowest passing percentage for the main pages was logged by the Kuwaiti sites at 22%.

In terms of the total number of passes, the Qatari sites again had the highest figures for their main and Contact Us pages, with 75 and 74 passes, respectively. The median number of passes came from the UAE sites, with 48 and 51 passes for their main and Contact Us pages, respectively. In contrast, the Kuwaiti sites ranked lowest in terms of passes, with 39 and 37 passes for their main and Contact Us pages, respectively.

As far as errors were concerned, the Kuwaiti sites ranked highest with 140 and 131 errors in their main and Contact Us pages, respectively, followed by the UAE sites with 123 and 122 errors. The Qatari sites had the lowest number of errors, scoring 91 for their main pages and 92 for their Contact Us pages.

Qatar also ranked highest in terms of unmeasurable criteria, with 84 and 83 criteria listed as being unmeasurable on the main and Contact Us pages of its sites. The UAE had the median position for its main page with a score of 79 and held the lowest position for its Contact Us pages with 77 unmeasurable criteria. Kuwaiti sites held the median position for their Contact Us pages with a score of 82 and the lowest main page figure for unmeasurable criteria at 71.
Figure 4-38 shows the overall passing and measurable criteria percentages held by the main pages of the three countries’ government sites. This assessment was performed using WCAG 2.0 Level A. The graph presents the overall situation of Kuwaiti, UAE, and Qatari sites in terms of quality, which can be assessed by comparing the measurable criteria and passing percentages revealed in the graph.

The graph shows that Qatari sites had the highest passing percentage of 45%, followed by UAE sites with a median passing percentage of 28%. Kuwaiti sites had the lowest passing percentage at 22%. The highest percentage for measurable criteria belonged to the Kuwaiti sites at 72%, whereas the UAE again held the median position with a percentage of 68%. Qatar had the lowest measurable criteria percentage of 66%.

The graph clearly depicts which country scored best in the WCAG 2.0 test, even though all the countries’ sites revealed a lack of accessibility-related web design consideration. The government sites and their two specific pages all reveal how accessibility in web design was
limited to default features that were deemed necessary. They constitute the minimal amount of web accessibility features that could exist on the sites.

**Figure 4-39: Kuwaiti, UAE, and Qatari websites – criteria passing percentage and percentage of measurable criteria on Contact Us pages**

![Graph showing the overall passing and measurable criteria percentages for Kuwait, UAE, and Qatar](image)

Figure 4-39 reveals the overall passing and measurable criteria percentages found on the Contact Us pages of the government sites for Kuwait, the UAE, and Qatar based on WCAG 2.0 Level A. The graph presents the overall situation of the three countries’ sites in terms of site quality, which can be assessed by comparing the measurable criteria and passing percentages shown in the graph.

The graph depicts that the Qatari sites had the highest passing percentage of 44%, followed by the UAE sites, which held the median passing percentage of 29%. Kuwaiti sites had the lowest passing percentage of 22%. In terms of measurable criteria percentages, the UAE sites had the higher score of 69% for their Contact Us pages, whereas the Qatari and Kuwaiti sites both had the lower percentage of 67%.

The graph’s data reveals the huge gap that exists between the measurable criteria percentages and the passing percentages for the three countries. This situation demonstrates how specific accessibility-related requirements were not implemented on the sites. Only
those accessibility features that resulted from the overlap of web design and accessibility considerations were incorporated.

Figure 4-40: Kuwaiti, UAE, and Qatari websites – average number of errors, passes, and unmeasurable criteria on Main and Contact Us pages

Figure 4-40 shows the overall number of average errors, passes, and unmeasurable criteria for Kuwaiti, UAE, and Qatari government websites based on WCAG 2.0 Level A. The graph explains the overall situation for all the countries’ government websites in terms of the average number of errors, passes, and unmeasurable criteria. This offers an aggregate view of the web accessibility situation for the three countries.

The graph shows that the average number of errors has the highest figure, with an average of 116.5 errors. The median average was found for the number of unmeasurable criteria, with each country having a score of 79.33. The lowest average was the total number of passes at 54 passes per country.
The data revealed in the graph clearly presents the situation for the government sites of the three countries. Only the bare minimum of web accessibility features was included by the developer and no other efforts have been put forth in this regard.

4.4.5 The Six Most Common Criteria, the Main Page, and the ‘Contact Us’ Page

4.4.5.1 Kuwait

Table 4-17: Kuwaiti websites – percentage of errors by government websites for six common criteria on Main and Contact Us pages

<table>
<thead>
<tr>
<th>E-government</th>
<th>Six Common Criteria</th>
<th>Total Errors</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Health</td>
<td>1.1.1 Non-text 1.3.1 Info and 2.1.1 Keyboard 2.4.1 Bypass Blocks 2.4.2 Page Titled</td>
<td>6</td>
<td>100%</td>
</tr>
<tr>
<td>Contact Us</td>
<td>6</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>General Secretariat of the Supreme Council</td>
<td></td>
<td>6</td>
<td>100%</td>
</tr>
<tr>
<td>Main Page</td>
<td>1.1.1 Non-text 1.3.1 Info and 2.1.1 Keyboard 2.4.1 Bypass Blocks 2.4.2 Page Titled</td>
<td>6</td>
<td>100%</td>
</tr>
<tr>
<td>Contact Us</td>
<td>6</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Ministry of Interior</td>
<td>1.1.1 Non-text 1.3.1 Info and 2.1.1 Keyboard 2.4.1 Bypass Blocks 2.4.2 Page Titled</td>
<td>6</td>
<td>100%</td>
</tr>
<tr>
<td>Contact Us</td>
<td>6</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Ministry of Defence</td>
<td>1.1.1 Non-text 1.3.1 Info and 2.1.1 Keyboard 2.4.1 Bypass Blocks 2.4.2 Page Titled</td>
<td>6</td>
<td>100%</td>
</tr>
<tr>
<td>Contact Us</td>
<td>6</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Ministry Of Finance</td>
<td>1.1.1 Non-text 1.3.1 Info and 2.1.1 Keyboard 2.4.1 Bypass Blocks 2.4.2 Page Titled</td>
<td>6</td>
<td>100%</td>
</tr>
<tr>
<td>Contact Us</td>
<td>6</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>The civil service</td>
<td>1.1.1 Non-text 1.3.1 Info and 2.1.1 Keyboard 2.4.1 Bypass Blocks 2.4.2 Page Titled</td>
<td>6</td>
<td>100%</td>
</tr>
<tr>
<td>Contact Us</td>
<td>6</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Ministry of Social Affairs and Labor</td>
<td>1.1.1 Non-text 1.3.1 Info and 2.1.1 Keyboard 2.4.1 Bypass Blocks 2.4.2 Page Titled</td>
<td>6</td>
<td>100%</td>
</tr>
<tr>
<td>Contact Us</td>
<td>6</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Ministry of Higher Education</td>
<td>1.1.1 Non-text 1.3.1 Info and 2.1.1 Keyboard 2.4.1 Bypass Blocks 2.4.2 Page Titled</td>
<td>6</td>
<td>100%</td>
</tr>
<tr>
<td>Contact Us</td>
<td>6</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Ministry of Education</td>
<td>1.1.1 Non-text 1.3.1 Info and 2.1.1 Keyboard 2.4.1 Bypass Blocks 2.4.2 Page Titled</td>
<td>6</td>
<td>100%</td>
</tr>
<tr>
<td>Contact Us</td>
<td>6</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Kuwait Government Online</td>
<td>1.1.1 Non-text 1.3.1 Info and 2.1.1 Keyboard 2.4.1 Bypass Blocks 2.4.2 Page Titled</td>
<td>4</td>
<td>67%</td>
</tr>
<tr>
<td>Contact Us</td>
<td>4</td>
<td>67%</td>
<td></td>
</tr>
</tbody>
</table>

Table 4-17 shows the percentage of errors when considering the six most common criteria in Kuwaiti main and Contact Us pages, using WCAG 2.0 Level A. The table defines the six common criteria and the frequency of errors that were found on the Kuwaiti pages.

The table reveals the main page error percentage as being the highest, i.e. 100% for the Ministry of Health, the General Secretariat of the Supreme Court Council, the Ministry of Interior, the Ministry of Defence, the Ministry of Finance, the Civil Service Commission, the Ministry of Social Affairs and Labour, the Ministry of Higher Education, and the Ministry of
Education. The lowest error percentage was recorded in the Kuwaiti government’s site, which showed 67% errors on the site.

In terms of the Contact Us page error percentage, the highest errors were recorded in the Ministries of Health, Defence, Social Affairs and Labour, Higher Education, and Education, as well as the Civil Service Commission and the General Secretariat of the Supreme Council, all of which showed 100% errors. The median error percentage was found on the Ministry of Interior and the Ministry of Finance Contact Us pages, where 83% errors were recorded. The lowest errors were recorded in the Kuwaiti government’s site, which showed 67% errors.

In terms of total errors, the highest numbers of errors were found in the Ministry of Health, the General Secretariat of the Supreme Council, the Ministry of Defence, the Civil Service Commission, the Ministry of Social Affairs and Labour, the Ministry of Higher Education, and the Ministry of Education, all of which showed six errors on both pages. The Ministries of Interior and Finance held the median error position with six errors on the main page and five errors on the Contact Us page. The lowest number of errors was found in the Kuwaiti government’s site, with four errors found on both pages.
Figure 4-41 indicates the percentage of errors pertaining to the six common criteria, applied on the main page and Contact Us pages of all the Kuwaiti government sites. The results were derived after applying WCAG 2.0 Level A. The graph explains which criteria experienced the most errors, out of the six most common criteria, highlighting the specific accessibility criteria that failed on all or most of the sites’ main and Contact Us pages.

The graph showed the “Non-text Content” (1.1.1) and “Info and Relationships” (1.3.1) being the criteria to score the highest error percentage of 100%, not passing the test on any Kuwaiti site. “Keyboard” (2.1.1) and “Page Titled” (2.4.2) held the median error percentage position with 95% errors found, passing the test on only one site. The lowest error percentage was found in the “Bypass Blocks” (2.4.1) and “Language of Page” (3.1.1) criteria, where 90% errors were found, and these criteria managed to pass the WCAG test twice on a site.

The graph clearly emphasises the fact that web accessibility-related implementations were not made on the Kuwaiti sites and the tests that these criteria did manage to pass were more a result of good web design than good web accessibility implementations. The graph shows
that little to no evidence exists related to web accessibility implementations on the Kuwaiti main and Contact Us pages.

4.4.5.2 The UAE

Table 4-18: Percentage of errors for each UAE government website for the six common criteria in Main and Contact Us pages

<table>
<thead>
<tr>
<th>UAE</th>
<th>1.1.1 Non-text</th>
<th>1.3.1 Info and</th>
<th>2.1.1 Keyboard</th>
<th>2.4.1 Bypass</th>
<th>2.4.2 Page Title</th>
<th>3.1.1 Language</th>
<th>Total Errors</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Health</td>
<td>1 1 1 1 1 1</td>
<td>6</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact Us</td>
<td>1 1 1 1 1 1</td>
<td>5</td>
<td>83%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ministry of Social Affairs</td>
<td>1 1 1 1 1 1</td>
<td>6</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact Us</td>
<td>1 1 1 1 1 1</td>
<td>6</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ministry of labour</td>
<td>1 1 1 1 1 1</td>
<td>6</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact Us</td>
<td>1 1 1 1 1 1</td>
<td>6</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ministry of Interior</td>
<td>1 1 1 1 1 1</td>
<td>4</td>
<td>67%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact Us</td>
<td>1 1 1 1 1 1</td>
<td>6</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ministry Of Finance</td>
<td>1 1 1 1 1 1</td>
<td>6</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact Us</td>
<td>1 1 1 1 1 1</td>
<td>6</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ministry of Higher Education</td>
<td>1 1 1 1 1 1</td>
<td>6</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact Us</td>
<td>1 1 1 1 1 1</td>
<td>6</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ministry of Education</td>
<td>1 1 1 1 1 1</td>
<td>4</td>
<td>67%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact Us</td>
<td>1 1 1 1 1 1</td>
<td>4</td>
<td>67%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UAE- Government Online</td>
<td>1 1 1 1 1 1</td>
<td>6</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact Us</td>
<td>1 1 1 1 1 1</td>
<td>6</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UAE - Almajles National</td>
<td>1 1 1 1 1 1</td>
<td>6</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact Us</td>
<td>1 1 1 1 1 1</td>
<td>6</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mygove uae</td>
<td>1 1 1 1 1 1</td>
<td>6</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4-18 reveals the error percentage of six common criteria in the UAE government sites’ main and Contact Us pages, based on WCAG 2.0 Level A. The table defines the frequency of errors that were found in the UAE sites pertaining to the six common criteria.

The table reveals the main page error percentage as being the highest at 100% in the Ministries of Health, Social Affairs, Labour, Finance, and Higher Education, as well as the UAE government’s site, the Al-Majles site, and the UAE’s MyGov site main pages. The lowest error
percentage of 67% was found in the Ministries of Interior and Education, where both managed to pass two WCAG 2.0 tests.

In terms of the Contact Us pages error percentage, it was found that the Ministries of Social Affairs, Labour, Interior, Finance, and Higher Education, as well as the UAE government’s site, the Al-Majles site, and the UAE’s MyGov site, all had the highest 100% error percentage on their Contact Us pages. The median error percentage for Contact Us pages was held by the Ministry of Health with 83% errors, managing to pass the test for only one criterion. The lowest error percentage was found in the Ministry of Education with 67% errors, qualifying for two WCAG tests.

In terms of total errors, the Ministries of Social Affairs, Labour, Finance, and Higher Education, as well as the UAE government’s site, the Al-Majles site and the UAE’s MyGov site, all showed complete (six) errors on both pages of the UAE websites. The median error amount was found on the Ministry of Interior site, which showed four errors on the main page and six errors on the Contact Us page. The lowest total errors were found in the Ministry of Education site, which showed four errors on both the pages.

**Figure 4-42: UAE websites – percentage of errors for the six most common criteria on all Main and Contact Us pages**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Percentage of Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1.1 Non-text Content</td>
<td>100%</td>
</tr>
<tr>
<td>1.3.1 Info and Relationships</td>
<td>100%</td>
</tr>
<tr>
<td>2.1.1 Keyboard</td>
<td>95%</td>
</tr>
<tr>
<td>2.4.1 Bypass Blocks</td>
<td>90%</td>
</tr>
<tr>
<td>2.4.2 Page Titled</td>
<td>95%</td>
</tr>
<tr>
<td>3.1.1 Language of Page</td>
<td>85%</td>
</tr>
</tbody>
</table>
Figure 4-42 shows the percentage of errors found in the main and Contact Us pages pertaining to the six common criteria on all UAE government sites. The graph explains the data derived after implementation of WCAG 2.0 Level A. The graph sheds light on the six common criteria that were found to be erroneous on all UAE sites. Also, given that these criteria are specific to web accessibility, the absence of these criteria on the site defined the true quality of the UAE sites’ main and Contact Us pages.

According to the graph, the “Non-text Content” (1.1.1) and the “Info and Relationships” (1.3.1) criteria revealed 100% errors on all UAE sites, whereas median errors were found in the “Keyboard” (2.1.1) and “Page Titled” (2.4.2) criteria, with 95% errors, and in the “Bypass Blocks” (2.4.1) with 90% errors. The lowest errors were recorded in the “Language of Page” (3.1.1), which showed 85% errors on the UAE government pages.

The results of the graph completely explain where the UAE government pages stand in terms of web accessibility design. The absence of web accessibility-specific criteria from all the UAE sites, such as 1.1.1 and 1.3.1, reveals that the developer incorporated only those accessibility criteria that were deemed as being unavoidable. Thus, it can be said that in places where web accessibility is present to an extent, it is the result of accidental design.
4.4.5.3 Qatar

Table 4-19: Percentage of errors for each Qatari government website for the six common criteria in Main and Contact Us pages

<table>
<thead>
<tr>
<th>Website</th>
<th>Main Page</th>
<th>1.1.1 Non-text [1.3.1 Info and 2.1.1 Keyboard]</th>
<th>2.1.1 Keyboard</th>
<th>2.4.1 Bypass Blocks</th>
<th>2.4.2 Page Titled</th>
<th>3.1.1 Language of Total Errors</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Health</td>
<td>1 1 1 1 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>Contact Us</td>
<td>1 1 1 1 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>Ministry of Social Affairs and Labor</td>
<td>1 1 1 1 1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>5</td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td>Contact Us</td>
<td>1 1 1 1 1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td>Ministry of Interior</td>
<td>1 1 1 1 0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>5</td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td>Contact Us</td>
<td>1 1 1 1 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td>Qatar tourism Authority</td>
<td>1 1 1 1 0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>5</td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td>Contact Us</td>
<td>1 1 1 1 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td>Ministry of Foreign Affairs</td>
<td>1 1 1 1 1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>5</td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td>Contact Us</td>
<td>1 1 1 1 1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td>Ministry of Higher Education</td>
<td>1 1 1 1 0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Contact Us</td>
<td>1 1 1 1 0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Ministry of Education</td>
<td>1 1 0 0 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>33%</td>
<td></td>
</tr>
<tr>
<td>Contact Us</td>
<td>1 1 1 0 0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>67%</td>
<td></td>
</tr>
<tr>
<td>Qatar Government Online</td>
<td>1 1 1 1 0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>Contact Us</td>
<td>1 1 1 0 0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>33%</td>
<td></td>
</tr>
<tr>
<td>The Ministry of Public Works</td>
<td>1 1 1 0 0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>Contact Us</td>
<td>1 1 1 0 0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>67%</td>
<td></td>
</tr>
<tr>
<td>Ministry of Information and Communications Tech</td>
<td>1 1 1 0 0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>Contact Us</td>
<td>1 1 1 0 0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>33%</td>
<td></td>
</tr>
</tbody>
</table>

Table 4-19 shows the error percentage found on the Qatari government sites’ main and Contact Us pages based on the six common criteria. The calculations were tested using WCAG 2.0 Level A.

The table reveals that the Ministry of Social Affairs and Labour, Ministry of Interior, Qatar Tourism Authority, Ministry of Foreign Affairs, and the Ministry of Higher Education had the highest main page error percentage, at 83%. The median error percentage was found in the Ministry of Health, Public Works Authority, Ministry of Communication and the Qatari government’s site, which all showed 50% errors on their sites. The lowest error was experienced in the Ministry of Education, which showed 33% errors on the site.
In terms of total errors, the Ministry of Higher Education revealed the highest errors with five errors in the main page and six in the Contact Us page. The median errors were found in the Public Works Authority, which showed three errors on the main page and four on the Contact Us page. The lowest errors were experienced on the Qatari government’s site and the Ministry of Communication, which experienced three errors on the main page and two errors on the Contact Us pages.

Figure 4-43: Qatari websites – percentage of errors for the six most common criteria on all Main and Contact Us pages

Figure 4-43 shows the percentage of errors pertaining to six common criteria using WCAG 2.0 Level A. The graph explains the extent to which each of the six criteria was employed on the Qatari sites. The graph also reveals the extent to which accessibility-related features were employed on the Qatari sites.

The graph shows the “Non-text Content” (1.1.1) as having the most errors, at 95%, followed by the “Info and Relationships” (1.3.1) criteria, which experienced 90% errors. The median error percentage was held by the “Keyboard” (2.1.1), “Bypass Blocks” (2.4.1), and “Page
Titled” (2.4.2) criteria, which showed 65%, 60% and 55% errors, respectively. The lowest errors were found in “Language of Page” (3.1.1), which showed 20% errors.

It is evident by the data in the graph that accessibility-related criteria revealed more errors on the Qatari sites, stressing the fact that accessibility-related requirements were only employed on the sites when it was considered essential to do so, or when no other choice was present. Thus, accessibility-specific criteria encountered more errors on all the sites.

4.4.5.4 Overall: Kuwait, the UAE, and Qatar

Table 4-20: Percentage of errors for each Kuwaiti, UAE, and Qatari government website for the six common criteria in Main and Contact Us pages

<table>
<thead>
<tr>
<th></th>
<th>1.1.1 Non-text</th>
<th>1.3.1 Info and 2.1.1 Keyboard</th>
<th>2.4.1 Bypass Blocks</th>
<th>2.4.2 Page Titled</th>
<th>3.1.1 Language</th>
<th>Total Errors</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kuwait</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Main Page</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>9</td>
<td>10</td>
<td>9</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>10</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>56</td>
</tr>
<tr>
<td>UAE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Main Page</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>10</td>
<td>9</td>
<td>9</td>
<td>10</td>
<td>8</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>57</td>
</tr>
<tr>
<td>QATAR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Main Page</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>9</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>2</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>10</td>
<td>7</td>
<td>6</td>
<td>6</td>
<td>2</td>
<td>41</td>
</tr>
</tbody>
</table>

Table 4-20 shows the overall error percentage for the six common criteria pertaining to the main and Contact Us pages of the three countries’ government sites. These calculations were performed using WCAG 2.0 Level A.

The table reveals that the highest main page errors were found on the Kuwaiti sites with 97% errors, followed by the median number of errors on the UAE sites with 93% errors. The Qatari sites revealed the lowest percentage of errors, at 65%, on its sites’ main pages. Considering the Contact Us pages, the UAE sites revealed the highest error percentage of 95%, followed by the median error percentage of 93% on Kuwaiti sites. The lowest Contact Us pages’ errors were found on the Qatari sites at 68% errors.
In terms of total errors, the Kuwaiti sites showed the highest errors with 58 and 56 errors on the main and Contact Us pages, respectively. The UAE sites held the median position with 56 and 57 errors on the main and Contact Us pages, respectively, while the lowest errors were found on the Qatari sites with 39 and 41 errors, respectively.

Figure 4-44: Kuwaiti, UAE, and Qatari websites – percentage of errors for the six most common criteria on all Main and Contact Us pages

Figure 4-44 reveals the overall error percentage found in terms of the six common criteria using the Web Content Accessibility Guidelines 2.0 Level A. The graph defines, in terms of criteria, how all the sites of the three countries incorporated the criteria in their web design. This information can help in assessing the overall quality of the sites in terms of web accessibility for the three countries’ government sites.

The graph shows the “Non-text Content” (1.1.1) as being the criterion with the highest errors on all the sites, i.e. 100%, followed by the “Info and Relationships” (1.3.1) criterion, which showed 98% errors. The median errors were experienced in the “Keyboard” (2.1.1) and “Page Titled” (2.4.2) criteria, which showed 87% and 82% errors on all the sites collectively. The
lowest overall error percentage was found in the “Bypass Blocks” (2.4.1) and “Language of Page” (3.1.1), which showed 80% and 65% errors on all the sites combined.

The graph clearly indicated that web accessibility was not considered when the developers designed the sites, so accessibility-related design features are often missing in a majority of government sites of the three countries. Only in places where accessibility-related design was unavoidable can instances of accessibility-specific requirements be experienced.

4.5 Testing the Governments’ Main Websites
4.5.1 Ranking

Table 4-21: Government websites – ranking of Kuwait, the UAE, and Qatar

<table>
<thead>
<tr>
<th>E-government</th>
<th>Total Page</th>
<th>Total Error</th>
<th>Total Pass N/A</th>
<th>Percentage of Pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kuwait Government Online</td>
<td>5</td>
<td>49</td>
<td>30</td>
<td>46</td>
</tr>
<tr>
<td>UAE- Government Online</td>
<td>5</td>
<td>74</td>
<td>11</td>
<td>40</td>
</tr>
<tr>
<td>Qatar Government Online</td>
<td>5</td>
<td>26</td>
<td>56</td>
<td>43</td>
</tr>
</tbody>
</table>

Table 4-21 shows the rankings of the government sites of Kuwait, the UAE, and Qatar using WCAG 2.0 Level A. The table shows that five pages of the three official government sites were tested with the 25 selected criteria, which revealed the following results.

The highest passing percentage was seen on the Qatari government’s site, which showed a 68% passing percentage, while the median passing percentage was held by the Kuwaiti government’s site, which showed a 38% pass. The lowest passing percentage was seen on the UAE government’s site, which showed only a 13% passing percentage.

The total pass count on the site was not different, as Qatar remained on top with the highest number of 56 passes, followed by Kuwait, which showed 30 passes at the median position. The UAE revealed the lowest pass count, at 11, on its government site.
The total errors found on the three sites revealed that the UAE had the highest with 74 errors, followed by Kuwait with the median error count of 49. Qatar showed the lowest errors on its government site with only 26 errors.

Unmeasurable criteria that could not be tested on the sites showed the Kuwaiti government’s site as having 46 unmeasurable criteria, the highest of all, while Qatar showed the median unmeasurable criteria, with 43 criteria unmeasurable on the site. The lowest unmeasurable criteria count was seen in the UAE site, where 40 criteria were not aligned with the WCAG criterion coding, thus resulting in those specific criteria on the site being unmeasurable.

Figure 4-45 shows the passing percentage and measurable criteria percentage of the three government sites of Kuwait, the UAE, and Qatar after applying the WCAG 2.0 Level A tests. The graph sheds light on the measurable criteria for the three sites, along with mentioning the extent to which the sites managed to pass the different criteria tests applied. The information revealed from the graph can help in assessing the quality of the sites and the level to which accessibility-specific criteria were implemented on the three sites.
The graph shows the Qatari government’s site as having the highest passing percentage at 68%, while the Kuwaiti government’s site showed the median passing percentage of 38%. The lowest passing percentage was experienced on the UAE government’s site, with a 13% passing percentage.

The measurable criteria percentage was revealed as being the highest on the UAE government’s site, whereas the median measurable criteria percentage was found on the Qatari government’s site, which showed a 66% availability of criteria. The Kuwaiti government site showed the lowest criteria availability with a 63% measurable criteria percentage.

The graph reveals important facts about the three countries’ government sites. The data explained that the Qatari government site had better performance in comparison to the other two sites with only a few errors found, while the Kuwaiti site showed more errors. The UAE government site had the highest measurable criteria, yet demonstrated the lowest passing percentage, which indicated that the site’s accessibility-related coding requirements were worse than the other two. The errors found on the sites indicated that all the sites failed certain accessibility-related tests, but the Qatari site offered more accessibility than the Kuwait ones, while the UAE site held the lowest accessibility results, indicating a clear absence of accessibility coding on the site.
Figure 4-46: Average errors, passes and unmeasurable in government websites of Kuwait, the UAE, and Qatar

The graph sheds light on the average of the three countries’ sites in terms of their quality and accessibility. The graph shows the average total errors as being the highest on all the sites at 49.67 errors, while the unmeasurable criteria held the median spot with an average of 43 criteria being unmeasurable for testing on all three sites. The pass average remained the lowest with 32.33 average passes on the three sites.

The data in the graph reveals that the average of passes on the sites was the lowest, which indicated that all three sites showed signs of accessibility-related design by default. The high average of errors, followed by the unmeasurable criteria, suggest that only those criteria that were considered as essential for the proper designing of the website were considered by the developer, whereas accessibility was not the foremost concern in the design of the three government sites.
Table 4-22: Ranking of government Main websites in Main and Contact Us pages in Kuwait, the UAE, and Qatar

<table>
<thead>
<tr>
<th>E-government</th>
<th>Total errors</th>
<th>Total Pass</th>
<th>N/A</th>
<th>Percentage of Pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kuwait Government Online</td>
<td>Main Page:</td>
<td>11</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Contact Us:</td>
<td>9</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>UAE- Government Online</td>
<td>Main Page:</td>
<td>13</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Contact Us:</td>
<td>14</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Qatar Government Online</td>
<td>Main Page:</td>
<td>6</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Contact Us:</td>
<td>4</td>
<td>12</td>
<td>9</td>
</tr>
</tbody>
</table>

Table 4-22 reveals the total errors, passes and unmeasurable criteria found on the main and Contact Us pages of the three government online sites of Kuwait, the UAE, and Qatar. This was done through applying the WCAG 2.0 Level A tests on the pages of the sites.

In terms of the main and Contact Us page findings on the three sites, the Qatari government’s site showed the highest pass rate on both pages with 63% and 75% passing percentages, respectively, followed by the Kuwaiti government site’s main page and Contact Us page, which revealed a 35% and 44% pass rate. The UAE government site’s pages showed the lowest passing percentages of 7% and 18%, respectively.

In terms of total passes, the Qatari government’s site again lead with the highest numbers, with 10 and 12 passes on the Main and Contact Us pages, respectively, while the Kuwaiti site showed the median number of passes, with six and seven on the main and Contact Us pages, respectively. The UAE site held the lowest number of passes on both pages, with one pass on the main page and three passes on the Contact Us page.

The total errors found on the pages of the sites revealed that the UAE had the highest errors of 13 and 14 on the main and Contact Us page, while the Kuwaiti site revealed 11 and nine.
errors on the main and Contact Us page, respectively. The Qatari site showed the lowest number of errors, with six on the main page and four on the Contact Us page.

The unmeasurable criteria on the main pages of the three sites were the highest on the UAE site, with 11 criteria being unmeasurable, followed by the Qatari site, which showed the median unmeasurable criteria of nine on its main page. The Kuwaiti site’s main page showed eight unmeasurable criteria, which was the lowest among the three. The Contact Us page findings revealed that the Kuwaiti and Qatari sites’ pages had nine unmeasurable criteria, the highest, while the lowest unmeasurable criteria count of eight was found on the UAE Contact Us page.

Figure 4-47: Percentage of passes and percentage of measurable criteria of government main websites on main pages of Kuwait, the UAE, and Qatar

Figure 4-47 shows the passing percentage and measurable criteria percentage on the main pages of the three government sites of Kuwait, the UAE, and Qatar, using WCAG 2.0 Level A. The graph reveals the quality of the sites’ pages through the comparison of measurable criteria and passing percentage of the pages.
The graph reveals that the Qatari site had the highest main page passing percentage of 63%, while the median passing percentage was held by the Kuwaiti government’s site at 35% passing. The UAE site’s main page showed the lowest passing percentage, at 7%.

In terms of the percentage of measurable criteria, the Kuwaiti site’s main page showed the highest availability at 68%, followed by the Qatari government site, which showed the median measurability of 64%. The UAE site’s main page revealed the lowest measurable criteria of 56%.

The information in the graph stresses the fact that the low passing percentages of the UAE and Kuwaiti sites are the result of non-accessibility-related coding by the sites’ developer, with the low passing percentage being the clear result of the requirement to implement only essential accessibility. The Kuwaiti site’s main page presented better results than the other two sites, but the number of errors on the site clearly indicated that the accessibility-related criteria found on the main page of the Qatari site could also have been the result of overlapping between web design and accessibility requirements of the site.

**Figure 4-48: Percentage of passes and percentage of measurable criteria of government main websites on Contact Us pages of Kuwait, the UAE, and Qatar**
Figure 4-48 sheds light on the passing percentages and the percentage of measurable criteria on the Contact Us pages of the three government sites of Kuwait, the UAE, and Qatar, when WCAG 2.0 Level A was implemented on the pages. The graph describes in detail the level of accessibility-related coding and the quality of the site by comparing the measurable criteria and passing percentages of the three government sites’ pages.

The graph shows that the Qatari government site’s Contact Us page had the highest passing percentage of 75%, while the median passing percentage was experienced on the Kuwaiti government’s page. The lowest Contact Us page passing percentage was held by the UAE government site at 18%.

The measurable criteria percentage witnessed on the three sites’ Contact Us pages revealed that the UAE government site had the highest availability of 68%, followed by the Kuwaiti and Qatari sites, both of which had the lowest measurable criteria at 64%.

The information in the graph explains that the passing percentage found on the Qatari site was good and indicated a high level of accessibility-related criteria coding present on the website’s page. However, the passing percentages on the Kuwaiti site and especially on the UAE site’s Contact Us page indicated that only the bare minimum of accessibility requirements were employed on the pages without any special focus on accessibility features.
Figure 4-49: Average errors, passes and N/A on Main and Contact Us pages on government main websites of Kuwait, the UAE, and Qatar

Figure 4-49 shows the average errors, passes and unmeasurable criteria found on the main and Contact Us pages of the three government sites of Kuwait, the UAE, and Qatar using WCAG 2.0 Level A. The graph provides information on the extent to which the sites’ pages managed to implement accessibility-related features by comparing the average passes, errors and unmeasurable criteria found. The total errors held the highest average of 9.5, followed by the median average of 9.0 unmeasurable criteria per page. The total pass count managed to hold on to the lowest average at 6.5 per page.

The findings of the graph clearly indicate that a very low average of passes was observed on the main and Contact Us pages of the three government sites, at an average of 6.5, which indicates that the implementation of WCAG criterion on the pages was only the result of essential accessibility requirements, rather than proper implementation.
4.5.2 The Six Most Common Criteria

Table 4-23: Kuwaiti, UAE, and Qatari websites – percentage of errors for the six most common criteria on main government sites

Table 4-23 shows the percentage of errors found on the government sites of Kuwait, the UAE, and Qatar for the six common criteria using WCAG 2.0 Level A. The table shows the errors found on the sites based on the six common criteria, along with revealing the total errors and error percentage of the criteria on the sites.

The highest error percentage was found on the UAE government’s site, which showed 100% errors with a total of 30 errors, followed by the Kuwaiti government’s site, which revealed the median errors of 67% with 20 errors. The lowest errors were seen on the Qatari government’s site, which showed a total of 10 errors and a 33% error percentage.

The “Non-text Content” (1.1.1) criterion showed the highest five errors on the UAE and Kuwaiti sites, while the lowest three errors were found on the Qatari site. “Info and Relationships” (1.3.1), “Keyboard” (2.1.1), and “Page Titled” (2.4.2) contained the highest five errors for both the UAE and Kuwaiti sites, while the lowest error was seen on the Qatari website, with only one error in all three criteria. “Bypass Blocks” (2.4.1) saw the highest five errors on the UAE site, while the median errors were seen on the Qatari site with four errors. The Kuwaiti site showed no errors for the criterion. “Language of Page” (3.1.1) showed the highest number of errors (five) on the UAE site, whereas no errors were found on the Qatari and Kuwaiti sites for that criterion.
Figure 4-50: Kuwaiti, UAE, and Qatari websites – percentage of errors for the six most common criteria on main government sites

The graph offers insight on the extent to which accessibility-related criteria were employed on the site by assessing the error percentage pertaining to the six common criteria.

The graph shows that the “Non-text Content” (1.1.1) had the highest error percentage of 87%, whereas the median error percentage was held by the “Info and Relationships” (1.3.1), “Keyboard” (2.1.1), and “Page Titled” (2.4.2) criteria with 73% errors. “Bypass Blocks” (2.4.1) showed 60% errors, whereas the lowest error percentage was experienced in “Language of Page” (3.1.1), which revealed 33% errors.

The information in the graph clearly reveals that specifically accessibility-related criteria, such as 1.1.1, saw the most errors on the sites, stressing the fact that accessibility-related features found on the site were not a result of focused accessibility coding, but rather a result of accessibility by default, incorporating only those features that were essential for the proper design of the websites.
Table 4-24: Percentage of errors of the six most common criteria in Main page and Contact Us page on government websites of Kuwait, the UAE, and Qatar

<table>
<thead>
<tr>
<th></th>
<th>1.1.1 Non-text Content</th>
<th>1.3.1 Info and Relationships</th>
<th>2.1.1 Keyboard</th>
<th>2.4.1 Bypass Blocks</th>
<th>2.4.2 Page Titled</th>
<th>3.1.1 Language</th>
<th>Total Errors</th>
<th>Error Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Kuwait Government</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>67%</td>
</tr>
<tr>
<td>Main Page</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Contact Us</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td><strong>UAE Government</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td>100%</td>
</tr>
<tr>
<td>Main Page</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Contact Us</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td><strong>Qatar Government</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>50%</td>
</tr>
<tr>
<td>Main Page</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Contact Us</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>33%</td>
</tr>
</tbody>
</table>

Table 4-24 shows the percentage of errors found on the main and Contact Us pages of the three government sites of Kuwait, the UAE, and Qatar based on the six common criteria. This was done using WCAG 2.0 Level A. The table reveals the total errors, error percentage and the number of errors that the six common criteria experienced individually.

The highest error percentage on both the pages was witnessed on the UAE site, where both the pages showed 100% errors with a total of six errors on both pages. The median error percentage was found on the Kuwaiti site, which showed 67% errors on both pages with a total of four errors on both, and the lowest error percentage was on the Qatari site, which revealed 50% errors on its main page with three errors, and 33% errors on its Contact Us page with two errors.

The most errors were found for the “Non-text Content” (1.1.1) criterion, which saw errors on all the pages without a single pass for the criterion. The “Info and Relationships” (1.3.1) and “Keyboard” (2.1.1) criteria represented the median errors, where both the Kuwaiti and UAE site pages showed errors, while the Qatari site managed to pass the 1.3.1 criterion only on its main page. “Page Titled” (2.4.2) also had errors on both pages of the Kuwaiti and UAE sites, but no errors were experienced on the Qatari site pages. “Bypass Blocks” (2.4.1) showed errors on both the UAE and Kuwaiti sites’ pages, while the Qatari site pages showed no errors.
The fewest errors were experienced for “Language of Page” (3.1.1), which only showed errors on the UAE main and Contact Us pages, while the other two sites showed no errors on their pages.

The information in the graph directed attention towards the fact that the three sites lacked accessibility-specific coding. The level of accessibility experienced on the sites’ pages is a result of the overlapping of design and accessibility features that are essential for good web design.

Figure 4-51: Percentage of errors for the six most common criteria on Main and Contact Us pages of government websites in Kuwait, the UAE, and Qatar

Figure 4-51 shows the percentage of errors found in the six common criteria on the main and Contact Us pages of the government sites of Kuwait, the UAE, and Qatar, using WCAG 2.0 Level A. The graph sheds light on the accessibility relatedness features found on the sites’ pages and how specifically they have been designed to keep accessibility in mind.

The graph reveals that the “Non-text Content” (1.1.1) criterion had the highest errors, i.e. 100%, followed by the “Info and Relationships” (1.3.1) and “Keyboard” (2.1.1) criteria, which both showed 83% errors. The median errors were found for “Page Titled” (2.4.2), which
revealed 67% errors, followed by “Bypass Blocks” (2.4.1) at 50% errors. The lowest errors were witnessed for “Language of Page” (3.1.1), which showed 33% errors.

The graph information clearly reveals that the pages were more specifically based on good web design, rather than good accessibility design. Criteria that were more inclined towards good design had fewer errors, as compared to criteria that were accessibility-related and experienced comparatively more errors. This clearly indicates that the accessibility features encountered on the website pages were only a result of default accessibility.

4.6 Testing of Main Guideline Principles

Table 4-25: Percentage of errors for four main guiding principles of WCAG 2.0 in Kuwait, the UAE, and Qatar

<table>
<thead>
<tr>
<th>E-government</th>
<th>Perceivable</th>
<th>Operable</th>
<th>Understandable</th>
<th>Robust</th>
<th>Percentage of errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kuwait</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>100%</td>
</tr>
<tr>
<td>UAE</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>100%</td>
</tr>
<tr>
<td>QATAR</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 4-25 explains the percentage of errors found on the sites of Kuwait, the UAE, and Qatar based on the main guiding principles of how perceivable, operable, understandable and robust the available content is. The table also presents the total percentage of errors found on the three countries’ sites. The table’s findings are based on the Web Content Accessibility Guidelines tests conducted on the sites of the three countries.

All of the three countries’ sites showed a 100% error percentage, with each having error in all the guiding principles, i.e., perceivable, operable, understandable and robust. These guidelines or criteria of success are governed by these four principles, which allow anyone to use and have access to the web content.

Perceivable content as a guiding principle refers to presenting the content, information and all other components of the interface to users in a manner that makes it easily perceivable by
them. Perceivable content refers to web presentation that is not invisible to all the senses of the users. All the sites had errors in this guiding principle, thus showing a 100% error finding.

Operable content refers to the components of navigation and the user interface being operable by users. In simple words, any interface that a user is unable to operate is not operable, thus completely hindering interaction between user and interface. Again, all the sites failed to secure any passes in this guiding principle, and errors in all the sites were experienced.

Understandable content, the third guiding principle, refers to the user interface operation and whether the information available is understandable by the user. Interaction between user and site cannot be developed if understandable content is not present. Basically, the interface operation and content should not be beyond the understanding of the user. All the sites experienced errors in offering understandable content, as 100% errors were found.

Robust is the last guiding principle of accessibility, and refers to the content being strong enough to be reliably interpreted by various different user agents, including through assistive technologies. This means that as the user agents and the technology evolve, the content should also accordingly remain accessible for them. All three countries’ government sites failed to pass this main guiding principle as well, showing a 100% error on all sites.

Errors in any of these four guiding principles indicate that individuals with disabilities will not be able to use those sites or access the web content on those sites. These four main guidelines have several success criteria and guidelines contained within them that address various principles related to disabled individuals. Several general usability guidelines are also included that determine the usability of the sites for both disabled and non-disabled individuals, but
WCAG 2.0 only includes those that are related to addressing problems specific to disabled individuals.

Figure 4-52: Percentage of errors for four main guiding principles of WCAG 2.0 in Kuwait, the UAE, and Qatar

Figure 4-52 shows the percentage of errors found on the sites of Kuwait, the UAE, and Qatar, with respect to the four guiding principles, i.e., Perceivable, Operable, Understandable and Robust. The errors were found after the WCAG 2.0 tests were applied on the sites. The information in the graph explains how accessibility-specific a website’s design was for people with disabilities, since the WCAG 2.0 applies criteria that are specific to disabled individuals’ accessibility to the web.

The graph indicates that all the sites were found to have 100% errors and none of the sites managed to pass the tests based on the four guiding principles. All three countries’ government sites failed to pass this guiding principle as well, showing 100% error on all sites.

The graph clearly indicates that none of the sites had been designed based on accessibility, specifically disability-specific accessibility on the sites, resulting in a complete failure to pass the tests, as 100% errors were found on all sites of the three countries.
4.7 Automated Tests with SortSite

4.7.1 Testing Government Websites - Kuwait

Table 4-26: SortSite testing results for each government website

<table>
<thead>
<tr>
<th>E-government</th>
<th>Overall Quality</th>
<th>Errors</th>
<th>Accessibility</th>
<th>Compatibility</th>
<th>Privacy</th>
<th>Search</th>
<th>Standards</th>
<th>Usability</th>
<th>Total Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Kuwait</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ministry of Health</td>
<td>296</td>
<td>172</td>
<td>179</td>
<td>120</td>
<td>168</td>
<td>133</td>
<td>289</td>
<td>172</td>
<td>296</td>
</tr>
<tr>
<td>Ministry of Social Affairs and Labor</td>
<td>31</td>
<td>4</td>
<td>28</td>
<td>22</td>
<td>24</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>121</td>
</tr>
<tr>
<td>General Secretariat of the Supreme Council</td>
<td>118</td>
<td>87</td>
<td>73</td>
<td>34</td>
<td>47</td>
<td>71</td>
<td>91</td>
<td>73</td>
<td>271</td>
</tr>
<tr>
<td>Ministry of Defense</td>
<td>128</td>
<td>58</td>
<td>120</td>
<td>45</td>
<td>78</td>
<td>108</td>
<td>108</td>
<td>108</td>
<td>354</td>
</tr>
<tr>
<td>Ministry of Finance</td>
<td>2,804</td>
<td>1,602</td>
<td>2,679</td>
<td>710</td>
<td>1,510</td>
<td>1,541</td>
<td>1,532</td>
<td>1,594</td>
<td>4,838</td>
</tr>
<tr>
<td>The civil service</td>
<td>1,665</td>
<td>1,477</td>
<td>1,662</td>
<td>1,556</td>
<td>1,620</td>
<td>1,623</td>
<td>1,622</td>
<td>1,622</td>
<td>1,965</td>
</tr>
<tr>
<td>Ministry of Interior</td>
<td>751</td>
<td>294</td>
<td>678</td>
<td>135</td>
<td>172</td>
<td>337</td>
<td>341</td>
<td>382</td>
<td>1,646</td>
</tr>
<tr>
<td>Ministry of Education</td>
<td>6,557</td>
<td>2,378</td>
<td>5,773</td>
<td>4,043</td>
<td>4,543</td>
<td>4,639</td>
<td>4,729</td>
<td>5,088</td>
<td>22,464</td>
</tr>
<tr>
<td>Kuwait Government Online</td>
<td>2,934</td>
<td>1,047</td>
<td>2,635</td>
<td>1,935</td>
<td>1,998</td>
<td>2,231</td>
<td>1,942</td>
<td>2,522</td>
<td>5,869</td>
</tr>
<tr>
<td>MAX</td>
<td>6,557</td>
<td>2,378</td>
<td>5,773</td>
<td>4,043</td>
<td>4,543</td>
<td>4,639</td>
<td>4,729</td>
<td>5,088</td>
<td>22,464</td>
</tr>
<tr>
<td>MIN</td>
<td>31</td>
<td>4</td>
<td>26</td>
<td>21</td>
<td>18</td>
<td>19</td>
<td>21</td>
<td>24</td>
<td>31</td>
</tr>
</tbody>
</table>

Table 4-26 shows the error summary of the automated test conducted by the SortSite software on all the sites of the Kuwaiti government. The table shows the results found in terms of overall quality, errors, accessibility test compatibility, privacy, search, standards and usability. The total pages tested on every site are also listed in the table. Automated testing offers some advantages over manual testing, but owing to the limitations of the system, automated testing is often used to support manual testing, as they yield the closest and most accurate results when compared with each other. The benefits of the automated testing process over manual testing include faster conduction time and guaranteed checking of all links; however, cross-checking the results with manual testing can eliminate the few hindrances found in the automated testing process, such as accuracy hindrances that may arise due to errors and standards of testing, while the content that the automated testing may have missed can be covered as well.

In terms of overall quality errors, the Ministry of Education showed the highest number, with 6,557 pages with errors, whereas the Ministry of Higher Education showed median overall quality errors totalling 751. The Ministry of Social Affairs and Labour showed the lowest overall quality errors at only 31.
As far as accessibility-related errors were concerned, the Ministry of Education had the highest with 5,773 errors, whereas the median errors were found on the Ministry of Higher Education site, which presented 678 errors. The lowest accessibility errors were seen on the Ministry of Social Affairs and Labour site, which had 26 errors.

Usability was one of the guidelines that experienced high errors, with the Ministry of Education presenting the highest errors at 5,088, followed by the Ministry of Higher Education site, which saw the median error number of 382. The lowest errors in terms of usability were found on the Ministry of Social Affairs and Labour site.

The table clearly states that the Kuwaiti sites were not designed specifically in terms of accessibility-related guidelines and criteria, as the percentage of errors found on almost every government site was rather high. The Ministry of Social Affairs and Labour, which presented the lowest overall accessibility- and usability-related errors, indicated that errors in the design of the site hinder proper accessibility of the site.

**4.7.2 Testing Five Pages with SortSite - Kuwait**

**Table 4-27: SortSite testing results on five pages of each government website**

<table>
<thead>
<tr>
<th>E-government</th>
<th>Overall Quality</th>
<th>Errors</th>
<th>Accessibility</th>
<th>Compatibility</th>
<th>Privacy</th>
<th>Search</th>
<th>Standards</th>
<th>Usability</th>
<th>Total Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kuwait</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Ministry of Health</td>
<td>5</td>
<td>0</td>
<td>5</td>
<td>3</td>
<td>0</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Ministry of Social Affairs and Labors</td>
<td>5</td>
<td>0</td>
<td>5</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>General Secretariat of the Supreme Council</td>
<td>5</td>
<td>0</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Ministry of Interior</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Ministry of Defence</td>
<td>5</td>
<td>0</td>
<td>5</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Ministry of Finance</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>The civil service</td>
<td>5</td>
<td>0</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Ministry of Higher Education</td>
<td>5</td>
<td>0</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Ministry of Education</td>
<td>5</td>
<td>0</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Kuwait Government Online</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>MAX</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>MEDIAN</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>MIN</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 4-27 shows the results of error tests conducted on five pages of every Kuwaiti government site using the SortSite automated testing process. The results depicted in the table were also verified by manual testing conducted by the researcher. The results found in the table were derived through the automated tested process using SortSite and backed by
the manual testing process, authenticating the findings of errors present on the Kuwaiti government sites’ five pages.

The table reveals that all the sites except the Ministry of Interior and the Kuwaiti government’s site had the maximum five overall quality errors. The Kuwaiti government’s site showed four errors, while the lowest overall quality errors were seen on the Ministry of Interior’s site, with three overall quality errors.

Accessibility- and usability-related tests revealed the same results as the overall quality error results, concluding that all sites had five errors in both the guidelines, except for the Ministry of Interior, which showed the lowest number, with three errors in both the accessibility and usability tests. The Kuwaiti government’s site again showed four errors in both usability and accessibility tests conducted on the site.

The findings of the table clearly indicate that error findings on all sites were the maximum five out of five errors, with no page managing to pass the overall quality, accessibility and usability tests, except the Kuwaiti government’s site, which passed the tests on a single page, and the Ministry of Interior’s site, which passed the tests on two pages for each guideline. The high percentage of errors proves that none of the sites were designed with accessibility motives in mind and thus almost all the sites fail to satisfy the accessibility, usability and overall quality standards tested on the sites.
### 4.7.3 Testing Government Websites - The UAE

#### Table 4-28: SortSite testing results for each government website

Table 4-28 shows the testing results of the UAE government site using the SortSite error testing features to access the number of overall errors, accessibility and usability-related errors found on each government site. SortSite is an automated accessibility testing process that delivers results much faster on a larger scale compared to manual testing procedures. In terms of achieving accurate results, manual testing and checking the findings of automated results is always a good idea, but once the validity of a reoccurring problem is established through cross-checking the issue manually and through automated processes, the automated process can then instantly test each occurrence at a much faster pace.

According to the findings of the table, the highest overall errors were seen on the UAE Ministry of Finance site, which showed 5,469 errors in total, followed by the Ministry of Education, which showed the median overall quality errors totalling 2,536. The lowest overall quality errors were experienced in the UAE’s MyGov site, where 55 overall quality errors were noted.

In terms of accessibility errors, the highest errors were found again on the Ministry of Finance site, which showed 5,187 errors in total, whereas the median accessibility errors were seen on the Ministry of Education site with 2,286 errors. The lowest number of accessibility errors (52) were found on the UAE’s MyGov site.
Usability errors were also found to be the highest on the Ministry of Finance site, showing 4,976 errors, whereas the Ministry of Education showed median usability errors of 2,034. The lowest errors were again seen on the UAE’s MyGov site, which showed 52 usability related errors.

The data in Table 4-28 presents the error summary found on the different UAE government sites when the automated SortSite testing was applied. The results show the level of errors to be rather high on almost all the country’s sites, with the UAE’s MyGov site being the one with the lowest overall quality, accessibility and usability errors. However, its conditions fail to satisfy the accessibility-specific tests that prove any site to be accessibility-specific in its design.

4.7.4 Testing Five Pages with SortSite - The UAE

Table 4-29: SortSite testing results on five pages of each government website

<table>
<thead>
<tr>
<th>UAE</th>
<th>Overall Quality</th>
<th>Errors</th>
<th>Accessibility</th>
<th>Compatibility</th>
<th>Privacy</th>
<th>Search</th>
<th>Standards</th>
<th>Usability</th>
<th>Total Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Health</td>
<td></td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Ministry of Social Affairs</td>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Ministry of Labour</td>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Ministry of Interior</td>
<td></td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Ministry of Finance</td>
<td></td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Ministry of Higher Education</td>
<td></td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Ministry of Education</td>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>UAE - Government Online</td>
<td></td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>UAE - Almajles National</td>
<td></td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 4-29 reveals the error summary recorded after application of the automated SortSite accessibility testing procedure on five pages of all government sites of the UAE. The same results were also found when manual testing of the sites was done. The table shows details of the errors found on all UAE sites in terms of overall quality, accessibility and usability. The information in the table can be used to access the quality of the sites checked and how precise their design proved to be in terms of the guiding principles of accessibility defined above.
The table shows the Ministry of Finance, the Ministry of Higher Education, the UAE government’s site, the Al-Majles site, and the UAE’s MyGov site as completely failing to pass the overall quality, accessibility and usability tests on all five pages. All sites showed errors on the five pages tested, with the Ministries of Social Affairs and Education showing overall quality, usability and accessibility errors on four of the sites’ five pages, whereas the lowest errors were found on the Ministry of Health site, which showed a total of three errors for all three guiding principles.

The findings of the table make it clear that usability, accessibility and overall quality are lacking in a majority of UAE government sites, with even the lowest error site showing more than half of the pages tested as having errors pertaining to the three tested principles of accessibility. Accessibility with respect to the three principles was not implemented in the website design when incorporated by the programmer, thus resulting in failure to pass the automated and manual tests conducted on the sites.

4.7.5 Testing Government Websites - Qatar

Table 4-30: SortSite testing results for each government website

<table>
<thead>
<tr>
<th>E-government</th>
<th>Overall Quality</th>
<th>Errors</th>
<th>Accessibility</th>
<th>Compatibility</th>
<th>Privacy</th>
<th>Search Standards</th>
<th>Usability</th>
<th>Total Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qatar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ministry of Health</td>
<td>1,923</td>
<td>1,257</td>
<td>1,903</td>
<td>1,894</td>
<td>850</td>
<td>1,446</td>
<td>1,883</td>
<td>1,882</td>
</tr>
<tr>
<td>Ministry of Social Affairs and Labor</td>
<td>821</td>
<td>203</td>
<td>270</td>
<td>71</td>
<td>20</td>
<td>203</td>
<td>206</td>
<td>513</td>
</tr>
<tr>
<td>Ministry of Interior</td>
<td>2,493</td>
<td>821</td>
<td>2,321</td>
<td>2,034</td>
<td>2,029</td>
<td>2,042</td>
<td>2,101</td>
<td>2,118</td>
</tr>
<tr>
<td>Qatar Tourism Authority</td>
<td>1,169</td>
<td>671</td>
<td>675</td>
<td>675</td>
<td>665</td>
<td>667</td>
<td>1,128</td>
<td>1,877</td>
</tr>
<tr>
<td>Ministry of Foreign Affairs</td>
<td>760</td>
<td>928</td>
<td>951</td>
<td>499</td>
<td>482</td>
<td>945</td>
<td>948</td>
<td>946</td>
</tr>
<tr>
<td>Ministry of Higher Education</td>
<td>2,140</td>
<td>535</td>
<td>1,803</td>
<td>86</td>
<td>464</td>
<td>487</td>
<td>475</td>
<td>981</td>
</tr>
<tr>
<td>Ministry of Education</td>
<td>96</td>
<td>5</td>
<td>84</td>
<td>31</td>
<td>0</td>
<td>34</td>
<td>80</td>
<td>84</td>
</tr>
<tr>
<td>Qatar Government Online</td>
<td>4628</td>
<td>2,380</td>
<td>4,561</td>
<td>3,395</td>
<td>735</td>
<td>4,004</td>
<td>4,408</td>
<td>4,468</td>
</tr>
<tr>
<td>The Ministry of Public Works</td>
<td>6,268</td>
<td>943</td>
<td>1,180</td>
<td>1,899</td>
<td>949</td>
<td>948</td>
<td>947</td>
<td>948</td>
</tr>
<tr>
<td>MIN</td>
<td>96</td>
<td>5</td>
<td>84</td>
<td>31</td>
<td>0</td>
<td>34</td>
<td>80</td>
<td>84</td>
</tr>
</tbody>
</table>

Table 4-30 shows the error summary formulated after application of the automated SortSite testing on the government sites of Qatar. The table reveals the results of errors found in the overall quality, errors, accessibility, compatibility, privacy, search standards, usability and total tested pages count. SortSite is an automated accessibility testing tool process that
delivers results much faster on a larger scale compared to manual testing procedures. In terms of achieving accurate results, manual testing and checking the findings of automated results is always a good idea, but once the validity of a reoccurring problem is established through cross-checking the issue manually and through automated processes, the automated process can then instantly test each occurrence at a much faster pace.

The table shows that the Public Works Authority had the highest errors on the three testing criteria of overall quality, accessibility and usability. The site showed 4,628 errors in the overall quality error category, 4,561 errors in terms of accessibility, and 4,466 errors in terms of usability. As far as median errors are concerned, the Ministry of Health had the median overall quality errors at 1,923, whereas the Ministry of Higher Education held the median errors of 1,809 and 981 in accessibility- and usability-related testing, respectively. The Ministry of Education showed the lowest errors in overall quality, accessibility and usability tests conducted on the site with 96, 84 and 84 errors, respectively. The Qatari government’s site could not be tested for the three guiding principles related to testing, so no data related to errors for the site is available.

The information in the table reveals that the Qatari sites showed contrasting results in terms of the findings on the Qatari sites, but the errors found in the automated SortSite tests draw attention towards the multiple failures that the sites incurred during the applied tests. This shows that even though some sites may appear to be passing the tests better than others, they still did not fulfil the accessibility-specific criteria. The table therefore indicates that the Qatari government sites were not designed with the principles of accessibility in mind.
### 4.7.6 Testing Five Pages with SortSite - Qatar:

Table 4-31: SortSite testing results on five pages of each government website

<table>
<thead>
<tr>
<th>Qatar</th>
<th>Overall Quality</th>
<th>Errors</th>
<th>Accessibility</th>
<th>Compatibility</th>
<th>Privacy</th>
<th>Search</th>
<th>Standards</th>
<th>Usability</th>
<th>Total Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Health</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Ministry of Social Affairs and Labor</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Ministry of Interior</td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
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Table 4-31 explores the government sites of Qatar through applying the automated SortSite tests on five pages of each website. The automated tests reveal the same results that were received when manual testing was applied on the same sites' pages. The table can be used to assess the overall quality, errors, accessibility, compatibility, privacy, search, standards and usability of the sites that were tested. The table presents a thorough picture of the level of errors found on all government sites of the country, explaining in detail which sites offered more accessibility-specific features and which sites struggled to pass the test. Not only do the results define the quality of the government site, but they also point out the sites that carry the highest, median and lowest errors in terms of usability, accessibility and overall quality errors.

Table 4-31 shows that the Qatar Tourism Authority, Public Works Authority, and the Ministry of Communication experienced the highest total of five errors (in five pages) in overall quality, accessibility and usability testing. Similarly, the median errors were seen in the Ministry of Interior, where the three testing principles had four errors on five pages. The lowest errors were recorded in the Ministries of Health, Foreign Affairs and Education, which all showed two errors in the overall quality, accessibility and usability tests. The Ministry of Higher Education and the Qatari government’s site could not be tested for accessibility.
Here again, the table indicates the high level of errors present on all the Qatari sites in terms of accessibility, usability and overall quality. Most of the sites managed to pass the accessibility tests on at least one page or more, but the failure of any one accessibility test indicates the failure to develop a site that is accessibility-specific. The data in the table reveals that the Qatari sites lack accessibility-specific features.
Chapter 5: Document Analysis:

5.1 Introduction

This chapter explores the state of play of disability policy and law in the Gulf region in order to provide context for the findings outlined in the previous chapter. As Section 3.5.4 “Document analysis” of Chapter 3 detailed, web searches were conducted across all e-government websites in Qatar, Kuwait, and UAE, with a focus by many searches on disability, accessibility, or equity. The purpose of these searches was to retrieve any documents that stipulated laws or policies related to the support for and treatment of people with disabilities in the countries in question. Once any such documents were located, they were then analysed in terms of not only their prevalence but also their content in relation to the governmental views of what rights people with disabilities should have and, where possible, how that relates to the use of e-government web-based information.

The following sections will present each country and their ministries, detailing Laws, Policies, Guidelines, Recommendations, and Mentions.

**Laws:** Using a web-based search engine, site search engine and site browsing, what documents or pages were available that made reference to disability in national laws, and how explicit were such laws in terms of government support for people with disabilities? Essentially, laws can be seen as the cornerstone of the provision of service and rights to people with disabilities, as they are enforceable. According to Rioux, Marks, Basser, and Jones, it is essential to understand the way laws work in order to avoid inequality for people with disabilities and to provide them with the best knowledge possible to benefit from those laws (Rioux, Marks, Basser, & Jones, 2011). In addition, the main goal of the law was to engage disabled people in the knowledge...
of understanding the laws and policies to help them preserve their rights (Waddington, Schwehr, Holmes, Picking, Braye & Corker, 2000).

**Policies:** Using a web-based search engine, site search engine, and site browsing, what documents or pages were available that made reference to policy at the governmental or organisational level, and how explicit were such policies in terms of whom they applied to, be it government employees as service providers or national citizens with disabilities and service consumers? Policies are often used to provide non-enforceable interpretations of articles of law, usually in a more contextually-focused and agile approach to best practise requirements. According to Brandon (2013), it is clear that people with disabilities deserve policy that clarifies the laws so that they know their rights (Brandon, 2013; Shogren & Turnbull, 2014).

**Guidelines:** Using a web-based search engine, site search engine and site browsing, what documents or pages were available that made reference to guidelines, typically in the how-to style? Such guidelines would typically be aimed at citizens with disabilities and might include guidance on how to apply for a disability-related service from a government agency.

**Recommendations:** Using a web-based search engine, site search engine and site browsing, what documents or pages were available that made reference to recommendations made specifically to government employees concerning how they might improve service provision to citizens with disabilities?

**Mention:** Using a web-based search engine, site search engine and site browsing, what documents or pages were available that made reference to disability or accessibility in any context?
For each of the above categories of documents for each ministry in each country, a value of Status, Details and Retrievable was recorded.

**Status:** Was a document or page location on the given ministry website for that item?

**Details:** If a document or page was available for the given category of document, was its content deemed (by the researcher) as being general or detailed in nature?

**Retrievable:** Was the document or page actually able to be retrieved and viewed? Did clicking on the item lead to an error 404 or missing file report?

Based on these parameters, the following sections will outline the documents and pages found, with some content analysis from within a selection of those documents.

**5.2 The state of Kuwait:**
The above process was applied to the 27 ministries that comprise Kuwait’s e-government at the time of writing. Table 5-1 shows that only seven of the ministry e-government websites mention Kuwait’s laws and disability, with five ministries containing policy and guideline documents, two containing recommendations, and 12 making mention of disability in some form or another not related to the other four categories. Only one ministry contained documents from across all five of the categories in question, although interestingly, this ministry’s accessibility audit (automated only) was particularly poor, indicating that documents relating to disability did not necessarily translate into a website that was disability-friendly.
With regards to Kuwait’s legal landscape, most of these websites provided limited evidence of or reference to disability law. Of the websites that did make reference to such laws, only one, the Kuwait Government Online, provided detailed information, in that its law documentation was both available and comprehensive in nature.

In regards to the Kuwaiti law pertaining to people with disabilities, the government has published a law document of ten chapters detailing the rights of people with disabilities and the responsibilities that officials have towards them. The law clearly defines the meaning of “disability” in terms of each article of law as well as assigning responsibilities to each government ministry. In addition, the law classifies and identifies all services that must be provided to people with disabilities as well as areas where improvements could be made (though these areas are not stipulated). The third chapter of this document specifically outlines that the rights of citizens with disabilities are to be protected in terms of the government’s responsibility to provide all help and support, including physical, mental, or
financial, to facilitate day-to-day living of such individuals. Chapters Four and Five reserve the rights for people with disabilities to work in various jobs (again, not stipulated) as well as the rights to be accepted and respected in the broader community. The sixth and seventh chapters indicate that the government, in collaboration with family, will provide support and help to people with a disability where financial and educational support are needed. The law takes into consideration any discrimination or bullying that might affect disabled people at their workplace or in general society, including the penalties that offenders can expect to face. Although the law document appears to take into consideration all the challenges faced by people with disabilities and their rights in regards to systems and technologies, there is no clear evidence of the role of digital accessibility in this law or protection of the rights of people with disabilities to equitable access to online information. Figure 5-1 shows a screenshot of the publication of the Kuwaiti law in 2010 in the official Kuwait newspaper, this newspaper being the required mechanism through which new and updated laws are published.

![Figure 5-1: A screenshot of the publication of the Kuwaiti law in 2010 in the official Kuwait newspaper](image)

It is interesting that all new and amended laws of the land are published via the national newspaper of Kuwait, yet only five of 27 government ministries felt the need to also reference the laws enforced by their own government, including the websites for the Ministry of Interior, the Kuwait National Assembly, and the Office Minister of State for the National Assembly.
After examining Kuwait’s law in regards to disability, a comparison was conducted to see how it compared to similar laws in nations that have had similar laws in place for a longer period of time, decades in most cases.

5.2.2 Policies

Of the 27 government websites in Kuwait, only one contained documents pertaining to policies for or about people with disabilities. Such policies include medical conditions and associated approvals for treatments to be sourced outside of Kuwait and renewal of licenses, such as drivers’ licences or disability welfare cards, along with which documents need to be filled in so that people with disabilities can receive government services. Figure 5-2 shows a screenshot of the policy that outlines the need for people with disabilities to occasionally renew their disability welfare card. Ultimately, it seems that although Kuwait has a substantial body of law regarding people with disabilities, in terms of policy documents that leverage that law in terms of ministries developing policies specific to their own governmental function, there is significant room for improvement.

Figure 5-2: The policy that outlines the need for people with disabilities to occasionally renew their disability welfare card
5.2.3 Guidelines
Only four of the 27 websites provide information regarding guidelines. The Sheikh Salem Al-Ali Centre for Hearing and Speech provides comprehensive information on how to apply for tools and services, such as hearing aids and hearing health. Moreover, the Kuwait Government Online, the Office of the Minister of State for the National Assembly and the Ministry of the Interior provide general information about disability-related events, available services, and, in particular, how to apply for disability services.

5.2.4 Recommendation
There are only two websites out of the 27 government websites reviewed that contain information regarding recommendations that can be accessed: the Office Minister of State for the National Assembly and the Sheikh Salem Al-Ali Centre for Hearing and Speech. Examples of recommendations include new laws and new policies to be adopted by the government and in the context of this research, such items relating specifically to people with disabilities.

5.2.5 Mention
As for mentions about disability in some form or another, 12 of the 27 websites of the Kuwaiti e-government contain some reference to people with disabilities. The Office for the Minister of State for the National Assembly, the Centre for Child Evaluation & Teaching, the Public Institution for Social Security, Kuwait Government Online, and the Kuwait National Assembly all make comprehensive mentions. Furthermore, seven websites have general information on disability, such as the Ministry of Health, Ministry of Social Affairs and Labour, Ministry of Interior, Ministry of Finance, Ministry of Islamic Affairs, Public Authority for Youth and Sport and the Sheikh Salem Al-Ali Centre for Hearing and Speech.
5.2.6 Web accessibility

However, none of the 27 reviewed websites make mention of the web accessibility standards, WCAG 1.0 or WCAG 2.0, in any way. Again, in terms of comparison, the Australia.gov.au site and most of its sub-agencies have an accessibility link at the bottom or top of each page outlining to what standard it is designed and the level of compliance currently achieved (see Figure 5-3).

![Australia.gov.au accessibility statement](image)

The United States government has their accessibility information on their site, although it is contained under a style guide link and does not make specific references to WCAG or U.S. Section 508. The UK government website equivalent is stored under their Government Services Design Manual (not linked specifically to each page) and makes claims against WCAG 2.0 AA as the target level of accessibility compliance.

Overall, it can be seen that for Kuwait, at the time of writing, a significant body of law existed that recognised the rights of people with disabilities and the services and support they should expect from the Kuwaiti government and society in general. However, these laws did not seem to make a distinction between ‘access to information’ and ‘access to digital information’.
5.3 The United Arab Emirates (UAE):

Table 5-2: The UAE e-government websites

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<td>Yes</td>
<td>Yes</td>
<td>NA</td>
<td>No</td>
<td>NA</td>
<td>No</td>
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</tr>
<tr>
<td>Ministry of Interior</td>
<td>Yes</td>
<td>Yes</td>
<td>NA</td>
<td>No</td>
<td>NA</td>
<td>No</td>
<td>NA</td>
</tr>
<tr>
<td>Ministry of Defence</td>
<td>Yes</td>
<td>Yes</td>
<td>NA</td>
<td>No</td>
<td>NA</td>
<td>No</td>
<td>NA</td>
</tr>
<tr>
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<td>NA</td>
<td>NA</td>
<td>No</td>
<td>NA</td>
<td>No</td>
<td>NA</td>
</tr>
<tr>
<td>Ministry of Foreign Affairs</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>No</td>
<td>NA</td>
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</tr>
</tbody>
</table>

Total Available: 45
Total Unavailable: 27

Keywords: C = Comprehensive, G = General, NA = NOT Available, A = Available

5.3.1 Law Documents

Of the 27 government websites reviewed, most websites were found to either lack information about disability laws or only provide limited access to them. Although a few websites, such as those for the Ministry of Labour, the Ministry of Interior and the Ministry of Defence, provided general information about laws, only one website for the Ministry of Social Affairs contained detailed and in-depth information regarding UAE law and disability. The UAE laws regarding disability take into consideration the rights of disabled people, where the law defined in detail who can be considered ‘disabled’ and under what conditions. Moreover, the law clarifies to all governmental bodies the services that need to be provided and by which agencies, taking into consideration each case on its own to generate a better outcome for the individual person with a disability. In the fourth and fifth sections of the law document, people with disabilities are considered equal in rights and responsibilities, where they should be respected and taken care of without any discrimination, in a similar vein to
that seen in the Kuwaiti legal documents. In addition, the government provides specialised education and social and financial support in order to prepare people with disabilities to face life and be productive in the broader community. In the UAE, it is forbidden to disrespect disabled people or discriminate against them, as it is considered to be a criminal act. Interestingly, unlike Kuwaiti law, the UAE specifically mentions equity of access to digital information as being aligned with the rights of people with disabilities, although modes of this digital accessibility are not specified. See an example below of accessibility law in the UAE.

![Accessibility Law Example](image)

5.3.2 Policies
Upon checking the 27 government websites for information relating to policies, only one website provided access to such information. Similar to the information about laws, the Ministry of Social Affairs provided comprehensive information about policies that relate to the provision of services and support for people with disabilities. Again, the policies are predominately about information regarding processes to gain services rather than policies

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that state how information can be accessed by people with disabilities or how such information should be stored and formatted for equitable use.

5.3.3 Guidelines
The Ministry of Interior was found to contain a single disability-related guideline document, which once again was a how-to style guide for applying for a disability service.

5.3.4 Recommendation
However, with regards to information about recommendations, none of the 27 government websites provided information that made recommendations for the provision of accessible information or accessible digital documents.

5.3.5 Mention
In contrast, 16 of the 27 reviewed websites did mention the term ‘disability’. Eleven websites provided general information when mentioning disabilities, including the Ministry of Health, the Ministry of Labour, and the Ministry of Interior. In addition to these websites, there were five websites that contained detailed information, such as the Ministry of Social Affairs, Ministry of Education, the Civil Service and the Zayed Higher Organization for Humanitarian Care. These terms were evident in seminars, news, events, training sessions and general information.

5.3.6 Web accessibility
None of the 27 government websites that were reviewed mentioned web accessibility standards at any level, a similar finding to that seen for the government websites of Kuwait.
5.4 The State of Qatar:

Table 5-3: Qatar e-government websites

<table>
<thead>
<tr>
<th>Type</th>
<th>Laws</th>
<th>Policies</th>
<th>Guidelines</th>
<th>Recommendation</th>
<th>Mention</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Status</td>
<td>Details Retrieveable</td>
<td>Status</td>
<td>Details Retrieveable</td>
<td>Status</td>
</tr>
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<td>NA</td>
<td>NA</td>
<td>NA</td>
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<tr>
<td>Ministry of Social Affairs and Labor</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>General Secretariat of the Supreme Council</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
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<td>NA</td>
</tr>
<tr>
<td>Ministry of Interior</td>
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<td>G</td>
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<td>NA</td>
</tr>
<tr>
<td>Ministry of Defense</td>
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<td>NA</td>
<td>No</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Ministry of Finance</td>
<td>A</td>
<td>NA</td>
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<tr>
<td>Ministry of Foreign Affairs</td>
<td>NA</td>
<td>NA</td>
<td>No</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Ministry of Oil</td>
<td>NA</td>
<td>NA</td>
<td>No</td>
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<td>NA</td>
</tr>
<tr>
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<td>NA</td>
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<tr>
<td>The Ministry of Public Works</td>
<td>A</td>
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<td>No</td>
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<tr>
<td>Ministry of Information and Communications Tech</td>
<td>A</td>
<td>G</td>
<td>Yes</td>
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</tr>
<tr>
<td>Ministry of Commerce and Industry</td>
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<tr>
<td>Ministry of Justice</td>
<td>A</td>
<td>G</td>
<td>Yes</td>
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</tr>
<tr>
<td>Ministry of Higher Education</td>
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<td>G</td>
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<td>Ministry of Education</td>
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<td>G</td>
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</tr>
<tr>
<td>Ministry of Islamic Affairs</td>
<td>NA</td>
<td>NA</td>
<td>No</td>
<td>NA</td>
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</tr>
<tr>
<td>Qatar Tourism Authority</td>
<td>NA</td>
<td>NA</td>
<td>Yes</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>General Secretariat of the Council of Ministers</td>
<td>NA</td>
<td>NA</td>
<td>No</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Qatar Society for Rehabilitation of Special Needs</td>
<td>NA</td>
<td>NA</td>
<td>No</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Family Counseling Center</td>
<td>NA</td>
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<td>No</td>
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<td>Social Rehabilitation Center</td>
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<tr>
<td>Ministry of Municipality and Urban Planning</td>
<td>NA</td>
<td>NA</td>
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<tr>
<td>Qatar Government Online</td>
<td>A</td>
<td>G</td>
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<td>NA</td>
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<tr>
<td>Qatar National Assembly</td>
<td>NA</td>
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<td>No</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

**Keywords:** C = Comprehensive, G = General, NA = NOT Available, A = Available

5.4.1 Law Documents

As with Kuwait and the UAE, 27 websites were evaluated for the Qatari government, with results indicating that most of the websites had fairly limited access to information about disability law. While a few websites, such as Qatar Government Online and the General Retirement & Social Insurance Authority, provided general information about laws, there were only eight government websites that provided information regarding disability laws, compared to 19 others where no evidence of such documents could be found at all.

Qatar laws took into consideration the provision of a decent life for people with disabilities, including all the arrangements needed to improve the lifestyles of people with disabilities. Qatar laws clearly state that the government and private sectors would provide all medical services, as well as equipment and plans needed for assistance to people with disabilities. Moreover, the government stated that disabled people have the right to obtain jobs, education and training. In addition, the government stated its commitment to support people...
with disabilities in terms of better housing and more recreational opportunities. The most obvious gap in the Qatari law is that it did not specify the right of disabled people to have clear access to digital information.

While digital accessibility was not stated in Qatari law, it should be mentioned that the Qatari government started a process to adapt digital accessibility for people with disabilities by establishing a guideline that stated all the procedures required to deliver the best outcome for individuals with disabilities in terms of digital information. Qatar was the only country to mention WCAG 2.0 specifically, with a stated level of compliance of AA by 2015. This policy document was dated October 2011 and was very detailed in that it listed all the government ministries (Appendix 3) that were required to meet WCAG 2.0 and by what date. The document even stated that banks (linked to the Qatar government-run Central Bank) had to have their automated teller machines accessible by 2013. The document did not mention how levels of compliance were to be assessed or who was responsible for checking that each agency had met these compliance requirements. As the next chapter will discuss in more detail, there are a number of factors that might have prevented Qatar from achieving any of its stated digital accessibility goals, including language, resources and toolsets. Australia is another country that specified the whole of its governmental digital accessibility goals (WCAG 2.0 AA) by a given timeframe and met them only in part (Conway, 2014b).

According to Conway:

Critical issues in Australia included insufficient understanding of WCAG 2.0 within the developer community, absence of real understanding of the DDA and the Advisory Notes and insufficient resources to address issues within a reasonable timeframe (2014b, p. 244).
Comparing Kuwait, the UAE, and Qatar, Kuwait had detailed laws to address the rights of people with disabilities and the government’s responsibility to support these people. Additionally, the Kuwaiti government had created several policies to achieve positive results for its citizens with disabilities despite demonstrating a lack of digital activity. As for the UAE, its laws still seem to be in their infancy, lacking clear details about the rights of disabled people in terms of digital technology. There is no doubt that the government addressed many issues for people with disabilities, but these were primarily service-oriented rather than being relevant to rights regarding digital information (see Figure 5-4). Lastly, Qatar’s law can be considered the least developed in terms of referencing digital accessibility despite the fact that Qatar had created one of the most detailed digital accessibility-related policy documents of the three countries included in this research.

Figure 5-4: Example of Qatar law

5.4.2 Policies
Two of the 27 Qatari websites were found to have information that could be defined as policies that were disability related. These were the websites of the Ministry of Justice and
the Qatar Government Online. These policy documents were of a basic nature, whereas another site, the Ministry of Information and Communications Tech, contained detailed and in-depth disability-centric information. Qatar’s website possessed clear information about the policies required to fulfil the requirements specified for people with disabilities. Moreover, Qatar was the only country in the Gulf region that had a vision and an established policy about e-accessibility, but the Qatar policy was last updated in 2011. The only outlier in the gulf countries is Qatar, due to the fact that this country possesses an understanding of policies through its guidelines for digital accessibility. See the example below of Qatar’s e-accessibility policy.

5.4.3 Guidelines
Similarly, only two out of the 27 government websites contained information pertaining to accessibility-related guidelines. However, the two websites belonging to the Ministry of Higher Education and the Ministry of Interior provided information about guidelines in general, although nothing too detailed or specific.
5.4.4 Recommendation
Similar to that found in guidelines, only the websites of the Ministry of Higher Education and the Ministry of Education provided any type of recommendation relating to people with disabilities.

5.4.5 Mention
Nevertheless, many of the websites reviewed did make reference to disability in some way, with 18 of the 27 government websites doing so. Examples of such mentions include news stories regarding disability, public events, or even conferences that were disability themed.

5.4.6 Web accessibility
Similar to Kuwait and the UAE, none of Qatar’s government websites made specific reference to web accessibility standards, except the Qatar Government Online website, which contained a detailed discussion of WCAG 2.0.

5.5 Comparison
5.5.1 International comparisons
In order to place some of the above document analysis into context, a comparison was conducted on disability-related law and policy in the United States, the United Kingdom and Australia. The rationale for this comparison was that there is a significant body of digital accessibility literature, websites, and accessibility advocacy activity taking place. These three nations are also seen as having strong support for the inclusion of people with disabilities in government and private enterprises as well as society as a whole (Jaeger, 2008; Shakespeare, 2013; Jaeger & Bowman, 2005).

The U.S. disability law is quite different from that of the Gulf region countries featured in this study in regards to digital accessibility. This is because the U.S. law provides a clear definition of an accessible information technology system as one that does not limit the user’s ability or senses of sight and hearing. Whilst Kuwaiti, UAE and Qatari law focuses heavily on service
provision for people with disabilities, they make limited or no mention of that fact that such information needs to be presented in an accessible way, using accessible formats. Australian law takes into consideration all forms of discrimination that could take place on the grounds of disability, including action plans and subsequent penalties for offenders found not to be acting in an equitable manner. Unlike the Kuwaiti, UAE and Qatari laws, Australian law does provide a clear explanation regarding equal access to traditional and digital information and states that discrimination against people with disabilities takes place if “the discriminator does not make, or proposes not to make, reasonable adjustments for the person” (Australian Government, 2015, p. 9). Australian law provides in-depth explanations into all aspects of discrimination against people based on their disability, and more importantly, it also specifies how these people face discrimination when accessing digital technologies. The law aims at eliminating discrimination by recognising that the rights and freedoms of people with disabilities are exercised by “supporting them to advocate for themselves, whether individually, through a third party or on a group basis” (Australian Government, 2013, p. 11).

As with the United States and Australia, UK law focuses less on services and more on self-determination by people with disabilities, stating that “where a provision, criterion or practise places a disabled person at a substantial disadvantage, and this relates to the provision of information, the steps which it is reasonable to take include steps to ensure that the information is provided in an accessible format” (UK Government, n.d., p. 104). It should be noted that disability law in Kuwait, the UAE and Qatar is fairly new in comparison to other countries, such as the United States, Australia and the UK, and that the model of self-advocacy by people with disabilities, and its inherent link to accessible information access, might take some time to develop in the wider government and social context.
In regards to the U.S. policy regarding web accessibility, it is stated by law under Section 508 that all individuals with disabilities should have access to information and data that is available on any government-run website or service. This policy ensures that all government-owned websites are designed to take into consideration the needs of people with disabilities. As Figure 5-5 illustrates, the accessibility statement for U.S. government websites can be accessed through a style guide page where accessibility requirements are outlined. The statement declares that the governmental website should be accessible and usable for people with disabilities, poor vision and low language proficiency.

Figure 5-5: Accessibility statement for the US government

As for the Australian government, it states that people with disabilities have the right to equal access to all kinds of media, including television, audio-visual and the Internet. In Australia, the accessibility requirements of government websites are outlined by the National Transition Strategy, a policy published in 2010 that set WCAG 2.0 AA compliance for federal and state government websites by the end of 2015. The Australian government accessibility requirements are, in most cases, more obvious than other nations in that an accessibility link can be found at the bottom of each site’s homepage, as shown in Figure 5-6.

Figure 5-6: Example of accessibility link
Once followed, this link then outlines which act or law the web accessibility is related to, the standard currently in place, and the standard that the site aims to eventually meet. Unlike other sites, the accessibility statement is also accompanied by a ‘Contact Us’ link so that people with accessibility concerns can communicate them to the site owners directly (see Figure 5-7).

**Accessibility**

*Under the Disability Discrimination Act 1992, Australian Government agencies are required to ensure information and services are provided in a non-discriminatory accessible manner.*

*Australia.gov.au* has been designed to meet the Australian Government standard established in respect of this requirement.

*Australia.gov.au* is currently compliant to Level A of the [Web content accessibility guidelines version 2.0](https://www.w3.org/WAI/standards-guidelines/wcag) (WCAG 2.0) standard. It is being upgraded to Double A compliance over time. In some cases, content will be accessible to Level Triple A.

WCAG 2.0 is a technical standard developed under the Web Accessibility Initiative of the World Wide Web Consortium (W3C).

If any information or service provided by [australia.gov.au](http://australia.gov.au) is inaccessible to you or you are experiencing problems accessing content for any reason, please [contact us](mailto:contact@australia.gov.au).

*Figure 5-7: Accessibility Statement-Australia*

Contrary to the U.S. and Australia, the UK government does not possess a clear policy about website accessibility for people with disabilities. In terms of an accessibility statement for UK government websites, the statement was listed under help->accessibility from the [gov.uk](http://gov.uk) website and was not a statement as such. Essentially, the [gov.uk](http://gov.uk) website indicated that it was designed to be as accessible as possible, and whilst WCAG 2.0 and other accessibility standards were not specifically mentioned, a list of compatible screen readers, a list of accessibility how-to and a ‘Contact Us’ for accessibility issues were available (see Figure 5-8).
Whilst the level of detail contained in Australian, U.S. and UK government websites varies in terms of detail, for the most part, statements regarding what accessibility is and how to comply can be found in close proximity to the homepage of these governments’ websites. Apart from Qatar, this specificity about types and levels of accessibility is the key difference between the government websites of the Gulf region nations examined in this study and those of Australia, the U.S., and the UK.

5.6 United Nations and Gulf region countries:
The purpose of the present United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) is to endorse, protect and ensure the complete and equal employment of human rights and freedoms by people with disabilities and at the same time, uphold and respect their dignity (UN, 2015). The UN defines people with disabilities as those with long-standing physical, mental, or sensory impairments which, combined with diverse obstacles, may obstruct their participation in society equally with others (UN, 2015). In the present UNCRPD, communication is defined as languages and accessible multimedia, along with written, audio, and other forms of communication, together with information and communication technology. Discrimination based on disability means exclusion or restraint based on disability, with the aim or effect of impairing or invalidating the recognition or
gratification, on an equal basis with others, of people’s rights and freedoms in such fields, including cultural, social and economic areas (Khan et al., 2015). Academic literature and any number of national websites establish a link between nations ratifying the UNCRPD and thus assuming the obligation of creating and promoting accessible web content. Given that Kuwait, the UAE and Qatar have all signed and ratified the UNCRPD, it seems that in terms of the state of national law, these nations are meeting their obligations to people with disabilities, but in terms of the implied web accessibility requirements, significant work still needs to be done. Of course, it should be stated that at the time of writing, these three nations were far from the only ones struggling in terms of web accessibility uptake and compliance (Kamoun & Almourad, 2014).

Finally, in relation to accessibility work being done in the region, the Gulf Disability United committee is an organisation that specialises in service provision to people with disabilities across the Gulf region. The committee was established in 1999 in the Kingdom of Bahrain in collaboration with all the neighbouring countries across the Gulf to form a unified strategy aiming to provide a consistent level of service in the disability space. For this reason, representatives from each country meet periodically to update the regulations to be compliant with the international standards that aim to improve the lives of disabled people in all aspects. Given the goals of this organisation, it seems interesting that not all nations have made efforts to apply, or at least mention WCAG standards in more meaningful ways. Table 5-4 summarises the list of disability laws and policies to which Kuwait, the UAE and Qatar are signatories.
5.7 WCAG 2.0 Resources and Tools in Arabic:
The previous chapter illustrated that there is little evidence of accessible web design practise taking place in the countries under study by this research. As the previous sections of this chapter have shown, this is not through a lack of laws relating to disability and equality, with all three countries having well-developed legal requirements for the inclusion and support of people with disabilities in the wider community. However, this legal framework does not seem to be bridging the gap between recognition of the rights of people with disabilities and equitable access to digital online information. Even in the case of Qatar, where accessibility standards, compliance levels and a deadline for achievement were specified, there appears to have been little impact from this document on e-government website content. The following section of this chapter will present evidence as to some possible reasons for this apparent lack of web accessibility traction, with the language of accessibility resources and tools being a major factor.

Language can be the most important part of learning new knowledge or understanding technical concepts or documents. For those that are new to the concepts of web accessibility, WCAG 2.0 can be a formidable document, as it assumes technical competency relating to mark-up languages and understanding of various forms of disability along with the interaction of both these areas in the form of assistive technologies. For those working in Arabic-speaking
nations, language is a major impediment to gaining accessibility knowledge, as WCAG 2.0 had, at the time of writing, yet to be fully translated into Arabic. At the time of writing, the W3C had a link to this draft document, which exists on the website of Alecso (Web Content Accessibility Guidelines [WCAG] 2.0 [2014], http://www.alecso.org/wcag2.0/). This draft contains a translation of the main principles of the guidelines without covering the criteria or examples. Figure 5-9 demonstrates the problem of WCAG 2.0 guidelines currently available in Arabic.

Figure 5-9: The problem of WCAG 2.0 guidelines currently available in Arabic

In the above example of 1.1 Non-text content criteria, the page contains links to the English version of the guidelines, where detailed explanations and contextualised how-to examples are maintained and added to on a regular basis. Figure 5-10 below shows the level of detail available in the English language version of the WCAG 2.0 guidelines on the W3C site.
As the above diagrams show, there is a marked discrepancy between the WCAG 2.0 resources available in Arabic versus those available in English. Having just the basic WCAG 2.0 guidelines without the associated resources to aid in both understanding and then applying them would seem to put developers from non-English-speaking backgrounds at a significant disadvantage.

As Hollier (2015) states:

If the basic WCAG 2.0 document has to wait more than six years for an authorised translation, and few other supporting resources are provided in Arabic at all, it’s not surprising that the pursuit of web accessibility in these areas is severely hampered – not by a lack of willingness as I’ve discovered, but a lack of resources.
In addition to the issues of Arabic accessibility resources, language also has an impact on some of the assistive technology and auditing tools used in conjunction with WCAG 2.0 guidelines. As an example, the screenshot below describes the number of steps required to install the NVDA screen reader in English and Arabic. In the first example, a fictional assistive technology user, Mike from the UK, only requires three steps to install the screen reader with English language support. In the second example, Ahmed from Kuwait wants to install the Arabic version of the screen reader, but as a result, there are four more steps required for a successful install. Aside from the extra download process required to obtain an Arabic language pack, which could require the use of an inaccessible shopping cart, there is the expense of the language pack, which ranged in price from US $200 – $700 at the time of writing.

The Mada website (2013) lists a number of Arabic screen reader solutions, including JAWS, Hal, Cobra, Ibsar, and of course, NVDA (with associated Arabic language packs). Aside from NVDA, the other tools ranged (in 2013) in price from US $3000 down to US $1300, and each had a listed number of pros and cons in terms of the interaction with digital documents and the accuracy of their Arabic language pronunciation (Mada, 2013). The reason that such tools
are important to those tasked with implementing accessible websites and content is so that the interaction between the coded site and digital documents as well as the assistive technology can be tested by the developer. As part of any testing and auditing processes, such as those outlined in WCAG-EM, developers need to be able to emulate the user’s perspective, and having access to a mainstream screen reader product is all part of a developer’s toolkit. As the above indicates, buying enough licences for these screen readers for a team of web developers would result in a significant cost burden to any organisation in the process of creating accessible sites. Additionally, the language issue can also impact the capability of some of the more mainstream tools to accurately represent Arabic language web content. As Al-Khalifa et al. (2011) stated when looking at a number of automated assessment tools, “Some of these tools presented false reports and were incorrect when used to assess Arabic websites; for that reason, these tools cannot be relied upon to test the accessibility of Arabic websites.”

5.8 In conclusion
This chapter has attempted to set the context for disability-related law, policy and activity in Kuwait, the UAE and Qatar. Part of the rationale for the analysis undertaken was the author’s view that the lack of accessibility practise evident in these Gulf nations was related to a lack of law relating to equity and disability in the region. As evidenced, all three nations have well-developed laws related to disability and equity, along with well-developed policies and guidelines regarding how the respective governments will support their citizens with disabilities. As stated, these documents were not always easy to find, especially via the e-government portal websites where ‘search’ functions either did not return relevant ‘disability’ results or were more focused on locating services rather than documents. When compared to other nations, such as Australia, the United States and the United Kingdom, the gaps that
were apparent in terms of interpretation of disability law are related to citizen rights relating to equitable access to online information, and in particular, government information. Australia dealt with this via quite clear references to WCAG 2.0 compliance levels, whilst the U.S. and UK tended to refer more broadly to accessible information and its use with assistive technologies.

The primary conclusion of this chapter is that language, rather than law, is likely the main barrier to developers in Kuwait, the UAE and Qatar implementing WCAG 2.0 in any identifiable manner. The tenets of accessibility, and the WCAG 2.0 in particular, can be very complex to understand and apply, and with the scant resources available in Arabic around the WCAG requirements at the time of writing, it seems unremarkable that the results outlined in Chapter Four showed an almost complete absence of accessible practice.

The next chapter will offer a discussion on what factors could bring about necessary change to web content accessibility in the Gulf region and address the outcomes of this thesis’s research questions.
Chapter 6: Discussion and Limitations

The aim of this research was to investigate the web accessibility of e-government websites for the Gulf region, inclusive of standards compliance, and evidence of accessibility awareness as well as the role of law and policy related to accessibility practise. This chapter will discuss the overall findings of this research with regard to the data presented in chapters four and five. Based on the findings from Chapters Four and Five, along with concepts identified in the literature review, the discussion will be framed around three primary themes: accessibility practise in the Gulf region, accessibility awareness, and accessibility and the law. The research’s supporting questions will be addressed across the discussion of these themes.

6.1 Accessibility practise in the Gulf region

• **Supporting question one**: To what level do Gulf State e-government websites meet web accessibility standards (WCAG 2.0)?

Lopes et al. (2010, para. 4) stated:

> Several recommendations have been proposed on how Web technologies should be used without posing barriers to people with disabilities, such as WCAG 2.0, the Web Content Accessibility Guidelines. WCAG 2.0 defines a set of guidelines that should be followed by developers, designers and website content managers when creating Web pages, in order to ensure a good level of accessibility for all users.

Research conducted to investigate if governmental websites in the Gulf region met web accessibility standards showed that none of the websites in the three countries examined in this research meet even basic accessibility requirements. The research started with the examination of ten websites from each of the three Gulf countries, taking into consideration the design issues and the technical capabilities amongst local governmental agencies. The results of whole-of-site automated testing conducted from the evaluation of the ten governmental websites acquired from Kuwait, Qatar, and the United Arab Emirates indicated a complete lack of accessible practise in the design of these e-government sites. As outlined
in the literature review, automated testing has the benefit of allowing whole-of-site testing in a small period of time while also inspecting very technical aspects of standards compliance (such as the correct use of HTML). The drawbacks of automated tests are that they can report false positives and false negatives and can miss fundamental usability issues that can only be interpreted by a human user (Foley, 2011; Vigo, Brown, & Conway, 2013; Borodin, Bigham, Dausch, & Ramakrishnan, 2010; Hanson & Richards, 2013). It is also worth noting that some researchers encountered issues with automated tools assessing Arabic language websites (Al-Khalifa et al., 2011), although this researcher was not aware of such issues with the SortSite product used in this research. Once a whole-of-site assessment was completed, a sample of pages was selected for manual assessment by an expert evaluator (Hollier, 2014), in this case, the researcher.

In terms of the manual expert testing, WCAG 2.0 Level A was used to evaluate the Kuwaiti, UAE, and Qatari e-government websites, which showed that in the allocated exploration, all three e-government websites had errors, despite some level of coincidental success (some aspects of pages passed but obviously not because of deliberate attempts to do so). Although none of the sites passed WCAG 2.0 to level A compliance, this research found that the core aspects of accessible practise, including techniques that could also be representative of basic HTML best practise, were problematic. Whilst all aspects of the WCAG 2.0 standard are important, the items outlined below are particularly important, which is why they are included at Level A as ‘minimum standard’.

1.1.1 Non-text Content:

Images not containing alternative text was a common issue across the pages that were manually assessed. Whilst using alt="" is valid when an image is purely decorative or imparts
no meaningful information, it is problematic when an image does contain useful information but does not have an associated text description (as shown in Figure 6-1 below).

![Figure 6-1: Example of image with no alt text](image)

Another slightly strange situation that occurred a number of times in terms of the alt text was that even when alt text was present, the content was written (and read by a screen reader) in English rather than in Arabic, as shown in Figure 6-2 below. The researcher was not sure this occurred, as there were some other examples of alt text that was correctly represented in Arabic.
1.3.1 Info and Relationships:

Website structure dictates that content flows correctly in a logical order. There are many elements that need to be checked in order to pass section 1.3.1 of WCAG 2.0, such as the correct use of heading levels (H1 to H6) and clear label tags for forms. The majority of the government websites tested in the three countries in the Gulf did not present site content in the correct order in terms of heading levels, with some of the websites not possessing headings or containing headings created in the wrong order. An example might be where a website uses the heading level 3 “h3” before using “h1”. During the investigation of the labels used in forms, the problem detected showed that in most of the websites, labels did not have matching label attributes with associated IDs. An example of bad (i.e., WCAG 2.0 A fail) practise is to have a label on a form field, such as “label for=first name”, but to then have an
ID attribute on the field that does not match, such as “id=first”. Whilst this example does not meet WCAG 2.0 A success criteria, for most screen readers, it will still produce a usable outcome for the assistive technology user. However, more problematic examples identified in this study arise where developers had obviously copied a form field and then replicated it numerous times so that the “label for=first name” was applied to more than one field in the form. Other common issues were having the “label for” value being left blank; both of these issues make such forms largely unusable by assistive technology users.

In relation to the caption and in terms of the tables, the majority of sites examined in this study indicated that the description of the caption was not related to the tables and that table meanings or concepts were totally different than the caption associated with them.

All these issues relating to information relationships contribute to a lack of accessibility for people with disabilities trying to use such sites and in particular, for those who are totally reliant on tools such as screen readers to identify and utilise content and content structure.

1.4.1 Use of Color

In terms of accessibility, webpages need to ensure that where colour is used to denote meaning (such as red meaning error), a textual equivalent is available. In regards to colour contrast, most of the websites did not comply with the guidelines related to contrast between the background and the foreground. Figure 6-3 below shows an example of a chart that relies on colour alone. This research found that there were over 90 pages that failed to comply with this criteria, with only 59 pages passing this criterion.
2.1.2 No Keyboard Trap

Whilst the commonly identified issues outlined above can make sites difficult or very difficult to use, keyboard traps can totally kill a website’s usability to keyboard-only users, such as those using screen readers. In order to pass criterion 2.1.2, the user must be able to navigate through the component or website using the keyboard only, without any trap or obstacle to the cursor progressing through the page content and navigational elements. During the manual assessment process, the researcher found 10 pages that exhibited keyboard traps that would prevent users from progressing further into a page or even into the entire site. Figure 6-4 below shows an example of a navigation menu that acted as a keyboard trap, which allowed users to tab into the menu and select any of the first six items, but on the destination pages, the user could not get out of the menu to read the page content. Other common keyboard traps were also navigation related in that users were automatically directed into
pop-up windows, which then captured keyboard focus; even if the user could close the new
window and return to the original page, the pop-up would then re-launch, essentially trapping
the user in an infinite loop.

Figure 6-4: An example of a navigation menu that acted as a keyboard trap

2.4.1 – Bypass Blocks

Unlike some of the other WCAG concepts outlined in this section, Bypass Blocks are very
unlikely to be ‘accidentally’ included in a website’s design where a total lack of accessibility
awareness is apparent. Assistive technologies, such as screen readers, read all the links on the
page, including all of those in the menu/navigation system. Developers should provide a
bypass block link to help people with disabilities easily skip to the content of the page without
having to have all the navigation links re-read on every page. The benefit of criterion 2.4.1 is
not only to skip to content within the website but also to jump directly to the most important
content of the web page. This research found that there were over 110 pages that failed to
comply with this criterion, with only 25 pages featuring bypass blocks.
3.1.1 Language of Page

It is important to define the language of the content of the website in an html tag in order to correctly support speech synthesisers to recognise the language of the website content. This was a common error across most pages examined in this study, with most pages defaulting to English but then having Arabic language written or pasted in. This does not seem to be an uncommon issue for pages where the content is in a language other than English, but the page language is defined in code as English (Maisak, 2015). In part, this is likely attributable to the use of a web content management system (WCMS) to manage the site and its content, with the WCMS being installed with English as the default language. This research found that there were over 90 pages that failed to comply with this criterion, with only 50 pages setting the language of the page as “ar”. Figure 6-5 below shows the lang attribute being set to en for English, with the rest of the coding being indicative of that contained in a WCMS-run website.

![Example of the language of the website; the website is in Arabic and the language of the website was set to English](image)

2.4.2 Page Titled

It is important to define the page titled in order to inform users with disabilities where they are on the website. This was one of the most common issues across every single website of each country. During the manual evaluation, the researcher found that there were over 100 pages that failed to comply with criterion 2.4.2. The error shows that developers of those
websites might have a lack of understanding regarding the benefit of titled pages for users with disabilities. Also, a page title helps visually impaired users not only understand what the page is about but it also supports people with visual impairment to find the right page quicker. Ideally, the page title should incorporate the page name, page description and website name. Figure 6-6 below shows an example where the same page title has been used across multiple pages in the same site, compounded by the use of an acronym for the page title, which does not inform the user regarding the page’s content.

![Image of a website with a page title of MOHE](image1)

Figure 6-6: An example where the same page title has been used across multiple pages in the same site

Figure 6-7 below shows a similar example of page titles being incorrectly applied, as the same uninformative page title is used across a majority of the webpages examined.

![Image of a website with an uninformative page title](image2)
Figure 6-7: Example of page titles being incorrectly applied

Figure 6-8 below shows a more informative use of page titles, but in this case, the titles were only presented in the English language, whereas the website content was in Arabic.

Figure 6-8: The titles are only presented in the English language, whereas the website content was in Arabic

4.1.1 Parsing

Finally, it is worth noting that not only did the sites indicate a lack of accessibility but that fundamental html coding errors also existed, which in turn contributed to the accessibility errors. This research found that there were over 135 pages that failed to comply with this criterion. The example below shows that the result of mark-up validation had many errors and warnings. As Figure 6-9 demonstrates, even a simple FAQ page on one of the sites under study produced 2029 errors, although this could either be 2029 distinct errors or one error at the top of the page with 2028 elements below it, which were then reported as errors as a result. Regardless, as Chapter Four indicated, there was a lack of fundamental html coding compliance across nearly all of the sites featured in this study.
Figure 6-9: A simple FAQ page in one of the sites under study produced 2029 errors

**Concluding remarks**

The analysis and comparison assigned to assess different criteria, countries and websites showed evidence of web accessibility practise or deliberate attempts at meeting WCAG 2.0 Level A requirements. Whilst a website can fail an accessibility audit, some elements of the site might still remain usable by users with disabilities, including those using assistive technologies. At the same time, pages that pass all aspects of a WCAG 2.0 compliance audit may actually be largely unusable by some people with disabilities (Rømen & Svanæs, 2012). Having said this, of course, where the WCAG 2.0 requirements listed above are absent or badly implemented, web pages can go from being partially usable to completely unusable, especially in terms of interactive elements, such as forms, captchas or interface elements that act as keyboard traps. As all of these issues were common across the sites examined in this study, the researcher feels that users with disabilities would find any of these e-government websites extremely difficult to use in their current form.

The three nations examined in this study are certainly not the only ones failing to meet even basic accessibility conformance, with other nations showing a distinct lack of accessibility practise in their e-government space (Kopackova, Michalek, & Cejna, 2010; Miesenberger, Karshmer, Penaz, Zagler, SpringerLink, & Springer-Verlag, 2012; Pribeanu, Marinescu, Fogarassy-Neszly, & Gheorghe-Moisii, 2012; Boussarhan & Daoudi, 2014; Galvez & Youngblood, 2016; Tashtoush, Darabseh, & Al-Sarhan, 2016). According to a research study examining web accessibility in China, Rau, Zhou, Sun, and Zhong stated, “The evaluation
results indicated that none of the surveyed websites passed all the checkpoints of Priority 1 in both studies, which means no website met the minimum requirement for web accessibility” (2016, p. 297).

In regards to the three countries examined in this study, analysis showed that automated and manual audits across the four “POUR” principles of WCAG 2.0 indicated numerous errors, many of which were fundamental and would make the sites extremely difficult to access for users with disabilities. The perceivable components of interfaces have shown errors across every website, particularly in terms of structure, colour contrast and the absence of non-text alternatives to visual elements. Operable components of websites, which have a significant impact on site usability by assistive technology users, indicated major concerns with the prevalence of keyboard traps and poorly labelled forms. The understandable aspects of site design commonly failed in terms of meaningful structure of page content and the language attribute used to define the base language of a page. Finally, web pages across most of the examined sites lacked robust design in that they contained large numbers of html coding errors, errors which by default have an impact on any accessibility compliance checks conducted on a given page and site.

Therefore, it would appear that most of the websites featured in this study were never designed to be accessed by people with disabilities, despite the fact that some individual criteria passed. Even for nations such as Qatar, which did make specific reference to WCAG 2.0, this accessibility standard seems to be unknown to e-government website developers in the Gulf region.
6.2 Awareness

- Supporting question two:

What are the levels of awareness of web accessibility guidelines in Gulf government organisations?

According to Brown and Hollier, there is:

A lack of awareness as to how people with disabilities are likely to engage with such content. While awareness of Web accessibility issues may have increased through the delivery of key policy and legislative frameworks, the practical reality is that the assessment and implementation of Web accessibility issues currently remains a highly specialised area of expertise and more training is required to support ICT professionals to incorporate Web accessibility principles into their work practises (2015, para. 26).

As demonstrated in the results shown for the first supporting question above, there appeared to be little or no awareness of accessibility practise in the Gulf region nations featured in this research. In order to put these results in some form of context, all e-government websites for the regions were studied to gain an understanding of law and policy (Abu-Doush, Bany-Mohammed, Ali, & Al-Betar, 2013) to see if ‘disability’ was identifiable as a part of national laws. As outlined in Chapter Five, it appeared that Kuwait, the UAE and Qatar had quite well-developed laws regarding the rights of people with disabilities, and that numerous support services were available. What did seem to be missing in terms of law, policy and other available documents was reference to the rights of people with disabilities to access online government information and services. Simply put, there was theory but little practise, even in nations like Qatar, which had actually signalled an awareness of web accessibility requirements and mandated compliance levels and deadlines. Even being signatories to the United Nations and Gulf disability protocols did not seem to impact these nations’ awareness of the tenets of web accessibility and the role it plays in equitable e-government. It would seem that a culture of digital accessibility is still in its infancy in terms of Gulf region e-
government services and that a near total lack of awareness is likely responsible for the lack of accessibility practise seen in this research.

This lack of accessibility awareness may be related to a lack of knowledge by government employees and website developers in regards to disability law and policy (Abu-Doush, Bany-Mohammed, Ali, & Al-Betar, 2013). As Rau, Zhou, Sun, and Zhong state in their research into accessibility in China, “The reason that explains low web accessibility in China is the lack of awareness rather than lack of technical skills” (2016, p. 297). In fact, the issue of awareness is highlighted by many authors as a key reason for a lack of web accessibility in any number of nations that have disability enshrined in law but not in practise (Kuzma, 2009; Conway, 2014; Basdekis, Klironomos, Metaxas, & Stephanidis, 2010; Kamoun & Almourad, 2014; Abu-Doush, Bany-Mohammed, Ali, & Al-Betar, 2013).

A questionnaire conducted and delivered to ten ministries in each of the three countries was included as part of this study in order to gain actual awareness from e-government website developers, but that response rate was even worse than the one reported in a study of Jordan by Abu-Doush, Bany-Mohammed, Ali, & Al-Betar (2013) and was, unfortunately, unusable. The limited set of responses reported in the Jordan study indicated a general lack of awareness of web accessibility principles and also indicated that even for those respondents who did have such awareness, none of them made reference to W3C or WAI accessibility resources. This is a particularly interesting finding, as this researcher feels that such a result is related to the dearth of accessibility resources available in the Arabic language, although the issue of language was not raised in the Abu-Doush, Bany-Mohammed, Ali, & Al-Betar (2013) study.
Language Barriers

It may very well be that part of the lack of accessibility awareness seen in the e-government websites of Kuwait, the UAE and Qatar is in no small part attributable to a lack of Arabic language accessibility resources and exemplars. Learning how to apply and test accessibility requirements can be a challenging exercise, and a lack of in-depth discussion and how-to guides in a developer’s native language would make the task particularly daunting. When the issue of auditing tools and assistive technologies having compatibility problems with the Arabic language are added to a lack of Arabic accessibility resources, perhaps the lack of awareness of accessibility in the Gulf region is more understandable. It is unfortunate that the survey mechanism in this research returned no usable results, as the issue of language, resources and bilingual website developers was covered in that survey. Whilst no conclusive link can be asserted between language and accessibility awareness, this research study argues that language must play some part in the results seen in this study.

Addressing the primary research question

The primary research question guiding this thesis was:

To what level are web accessibility standards applied in Gulf State E-Government Websites?

The answer, certainly in terms of the three nations of Kuwait, the UAE and Qatar, is that web accessibility standards are not being applied at any meaningful level. Qatar specifically mentions accessibility standards in a single document as well as when they should have been implemented but then seems to have done no further work in the area. The other two nations of Kuwait and the UAE made no mention of web standards that could be located on publically available e-government websites. Whilst the law and policy of all three nations would seem to imply solid national recognition of rights for people with disabilities, these rights did not
seem to be interpreted as being relevant to the access and use of e-government websites and associated services.

As discussed in the last two chapters, the lack of application of accessibility standards does not seem to have been done maliciously or deliberately; it simply appears that the concept of web accessibility is almost entirely unknown to the owners and developers of these e-government websites. Exactly why this total absence of accessibility awareness exists is currently unknown, and this will form part of the future research in this area.

6.3 Future research
One of the findings of this research suggests that the language of WCAG 2.0 guidelines and associated explanatory resources and exemplars might be creating a barrier to accessibility awareness. If website developers do not have access to resources available in their native Arabic language, it could make it difficult to understand the limited set of materials available to them. There is no doubt that despite these governments possessing a clear awareness about the rights of people with disabilities in terms of law and policy, the lack of digital services as a result is evident in the results shown in Chapters Four and Five.

Future research should take place in a number of the organisations that manage the e-government websites in the Gulf region, where researchers could actually work with developers and managers directly to ascertain their understanding of web accessibility and why it has yet to be implemented in a meaningful way. This would help to determine whether, as this researcher believes, language is a primary barrier to accessibility awareness or if other cultural, technological or financial factors are at play. Given the difficulty experienced by this researcher and others in the field in terms of conducting surveys with these organisations, a more face-to-face, embedded approach might produce more quantifiable outcomes.
6.4 Limitations of the study
The primary limitation of this study, as outlined above, is a lack of knowledge about the views that the e-government agencies hold in relation to web accessibility. Even though a great deal of effort was put into developing both English and Arabic versions of a web-based survey and the fact that this survey and a detailed recruitment letter were sent to administrators for each of the agencies featured in this research, only one response was received, which basically demonstrated that the organisation had no awareness of accessibility and did not wish to be contacted further regarding the issue. The researcher feels that if more of these surveys had been returned, then the results of Chapter Four could have been framed in a better context. As it is, Chapter Five attempted to address the issue of awareness by looking for evidence of both disability law/policy on the e-government websites as well as any reference to WCAG 2.0 on the sites. Whilst the total lack of WCAG 2.0 compliance and a near total lack of reference to WCAG 2.0/accessibility would seem to support the conclusion that there is essentially no awareness of accessibility, it does not explain why.

Conclusion
This thesis sought to address the question of to what level accessibility compliance was evident in e-government websites in the Gulf nations of Kuwait, the UAE and Qatar. Automated and manual auditing results showed that no compliance was evident and that little or no awareness of web accessibility was evident in terms of documents contained within these e-government websites. Whilst all three nations supported the rights of people with disabilities, these rights did not seem to translate to equitable access to online information and services. Services referenced on the e-government sites examined were largely support services in nature, but using the sites as a service did not seem to be inherent in their design. The question of why this was so was not clearly addressable with the data.
available to the researcher, although issues of Arabic language accessibility resources and tools were considered as a likely barrier to accessibility uptake.

Ultimately, as more and more government services move to the cloud and away from brick-and-mortar institutions, e-government websites will need to become truly accessible or else national citizens with disabilities will become excluded from government services. As Anderson, Bohman, Burmeister, and Sampson-Wild (2004, p.303) stated:

> When all things are considered, making Web content – especially government Web content – accessible to people with disabilities is a matter of basic human rights. This is the answer to the question of why this important. It is not enough to merely be aware of what to do or how to do it. With this in mind, the most important thing for developers to remember when designing accessible Web content is that they are designing it for real people with real needs, and not just to satisfy a checklist of guidelines.

It would seem that at the time of writing, e-governments in the Gulf region have yet to obtain sufficient awareness to reach either the why or the how stage of accessible e-government.
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Appendices:

Appendix 1: Screenshots from the English version of survey:

Section 1: W3C Questions:
The World Wide Web Consortium (W3C) is the organisation which manages
and leads the develop of web standards and association technologies (such
as HTML5, CSS, XML, WCAG 2.0 etc)

we are aware of the W3C’s role in developing web standards:

- Strongly agree
- Agree
- Disagree
- Neither Agree nor Disagree

E-government staff keep up to date with W3C activities:

- Strongly agree
- Agree
- Disagree
- Neither Agree nor Disagree

Our staff participate in W3C activities (through W3C groups or requests for
feedback):

- Strongly agree
- Agree
- Disagree
- Neither Agree nor Disagree

Our staff participate in W3C activities (through W3C groups or requests for
feedback):

- Strongly agree
- Agree
- Disagree
- Neither Agree nor Disagree
Section 2: WCAG Questions:
The Web Content Accessibility Guidelines 2.0 (WCAG 2.0) were released by the W3C in 2008 in order to provide guidelines and techniques for making web technologies accessible to all users, including those with disabilities.

We are aware of the importance of WCAG 2:
- [ ] Strongly agree
- [ ] Agree
- [ ] Disagree
- [ ] Neither Agree nor Disagree

We are aware of the requirements of the different levels of WCAG 2 A, AA and AAA:
- [ ] Strongly agree
- [ ] Agree
- [ ] Disagree
- [ ] Neither Agree nor Disagree

Our website already meets WCAG 2 level A:
- [ ] Strongly agree
- [ ] Agree
- [ ] Disagree
- [ ] Neither Agree nor Disagree

We are working towards achieving WCAG 2 level A:
- [ ] Strongly agree
- [ ] Agree
- [ ] Disagree
- [ ] Neither Agree nor Disagree

Ultimately, we are working towards achieving WCAG 2 AA in our website:
- [ ] Strongly agree
- [ ] Agree
- [ ] Disagree
- [ ] Neither Agree nor Disagree
We have problems understanding WCAG 2 requirements:

- Strongly agree
- Agree
- Disagree
- Neither Agree nor Disagree

We are aware of the difference between WCAG 1.0 and WCAG 2.0:

- Strongly agree
- Agree
- Disagree
- Neither Agree nor Disagree

We currently have no plans to apply WCAG 2.0 to our website:

- Strongly agree
- Agree
- Disagree
- Neither Agree nor Disagree

We are aware that our website has not meet the requirement of WCAG2.0 at any levels.

- Yes
- No
- Unknown

Our website has met:

- WCAG 1.0 LEVEL A
- WCAG 1.0 LEVEL AA
- WCAG 1.0 LEVEL AAA
- WCAG 2.0 LEVEL A
- WCAG 2.0 LEVEL AA
- WCAG 2.0 LEVEL AAA
Section 3: Agency and Staff view and attitude Questions

Web accessibility is the concept that web pages, web applications and website content should be usable and readable by people with disabilities (such people with physical disabilities, blindness or sight impairment, people with hearing loss or profound deafness, those with cognitive and learning disabilities or those in their advanced years of age). Using accessible design techniques, websites and web content can be made usable to all people, even those using specialised software and hardware (assistive technologies) to interact with web.

we believe that web accessibility is not important for our website

☐ Strongly agree
☐ Agree
☐ Disagree
☐ Neither Agree nor Disagree

we believe that web accessibility will improve the quality of our website

☐ Strongly agree
☐ Agree
☐ Disagree
☐ Neither Agree nor Disagree

we believe that web accessibility will improve the quality of our website

☐ Strongly agree
☐ Agree
☐ Disagree
☐ Neither Agree nor Disagree

we believe that WCAG 2.0 is too difficult to implement:

☐ Strongly agree
☐ Agree
☐ Disagree
☐ Neither Agree nor Disagree
Our developer team have lack of knowledge and skills about web accessibility:

- Strongly agree
- Agree
- Disagree
- Neither Agree nor Disagree

We need web accessibility auditors who can evaluate and test our website.

- Strongly agree
- Agree
- Disagree
- Neither Agree nor Disagree

Our website can be accessed by people with disabilities.

- Yes
- No
- I do not know

Is there web accessibility policy or guideline from the government?

- Yes
- No
- I do not know

Is there web accessibility policy or guideline from the government?

- Yes
- No
- I do not know

Our government have established a clear guideline to achieve the requirement of WCAG 2.0.

- Strongly agree
- Agree
- Disagree
- Neither Agree nor Disagree
Our staff would attend professional courses in web accessibility were they available.

- Strongly agree
- Agree
- Disagree
- Neither Agree nor Disagree

We believe that there is a small number of people who benefit from implementing web accessibility features.

- Strongly agree
- Agree
- Disagree
- Neither Agree nor Disagree

There is limited budget for implementing web accessibility features.

- Strongly agree
- Agree
- Disagree
- Neither Agree nor Disagree

Our government is trying to educate staff regarding web accessibility issues.

- Strongly agree
- Agree
- Disagree
- Neither Agree nor Disagree

What are some of the challenges to making your website(s) more accessible?

- Cost
- Time
- Policy
- Language
- Skills

Has your organisation received complaints about the E-government website regarding to accessibility issues (ie from users with disabilities trying to use your site)? If yes, please explain

[Blank space]
Section 4: Assistive technologies Questions:

Assistive technologies are hardware or software devices that allow users with a variety of disabilities to interact with websites and web content. Screen readers are amongst the most common type of Assistive Technology, and allows users who are blind or visually impaired to have website navigation and content read out to them so that they can interact with the site using a keyboard only.

We are aware of assistive technologies:
- Strongly agree
- Agree
- Disagree
- Neither Agree nor Disagree

We are not aware of any screen readers that support Arabic language:
- Strongly agree
- Agree
- Disagree
- Neither Agree nor Disagree

We aware of screen reader technologies that support the Arabic language:
- Yes
- No
- Please Explain (if yes)

We aware of screen reader technologies that support the Arabic language:
- Yes
- No
- Please Explain (if yes)

Which (if any) of the following screen readers are you aware of:
- NVDA
- JAWS
- ChromeVox
- Microsoft Narrator
- Other

Which (if any) of these other types of Assistive Technologies are you aware of or have experience with:
- Screen Readers
- Screen magnifier
- Alternative Input Devices
- Trackballs
- Other

Our staff have used assistive technologies to test website accessibility:
- Yes
- No
- Please List (if yes)
Currently, how does your department assist people with disabilities using the E-government website?

Section 5: Evaluation websites Questions:
In order to ensure that websites meet accessibility requirements (such as WCAG 2.0), testing and assessment methods are typically used to ascertain the level of accessibility. Testing can be done using automated checking tools (such as some of those listed below), or by using manual testing processes where developers or users interact with the website using Assistive Technologies to ensure they work correctly with the site. Both these automated and manual techniques can be used in conjunction with each other.

We are aware of the differences between these Automated Manual testing approaches?

- [ ] Strongly agree
- [ ] Agree
- [ ] Disagree
- [ ] Neither Agree nor Disagree

What is the automated tools do you use to review websites?

- [ ] Wave
- [ ] SortSite
- [ ] Achecker
- [ ] OpenWax
- [ ] Other

We have experienced problems with automated tools with Arabic websites

- [ ] Strongly agree
- [ ] Agree
- [ ] Disagree
- [ ] Neither Agree nor Disagree

Do you have people with disabilities to test your website?

- [ ] Yes
- [ ] No

What (if any) is the manual accessibility process you use to review websites?
Section 6: Language and Resources:
Lack of Arabic language accessibility resources makes implementing accessible websites difficult.

Currently, how does your department assist people with disabilities using the E-government website?

0 10 20 30 40 50 60 70 80 90 100
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Availability of web development and accessibility tools in Arabic language can cause problems for web development:

☐ Strongly agree
☐ Agree
☐ Disagree
☐ Neither Agree nor Disagree

How do your web development staff locate and use resources for any web development tasks?


Does your organisation use external contractors for your website development and management?

☐ Yes
☐ No
☐ If yes, have these contractors ever raised the issue of web accessibility
Section 7: Conclusion

Thank you for participating in this survey. If you have any other thoughts or comments to contribute to this research in terms of website accessibility in your organisation, please feel free to provide it below.

If you would be willing to participate in a follow up phone interview regarding this research area, please indicate below:

☐ Yes
☐ No

Thank you for your contribution to this research – your time and effort is greatly appreciated.

Appendix 2: Screenshots from the Arabic version of survey:
القسم 1: أمثلة منظمة W3C (رابطة الشبكة العالمية)
رابطة شبكة الويب العالمية هي المنظمة المعنية بإدارة وقيادة عملية وضع معايير شبكة الإنترنت والتقنيات المتعلقة بذلك (مثل لغة تكوين صفحات الويب الشخصية لغة تسمية النص الادبي HTML5 ولغة صفحات المحتوى W3C أو CSS) أو كاستخدامات yabancı لغة النص الادبي (XML) واتساع إنتاجية محتوى الويب (WCAG 2.0) وغيرها.

تسهم جميع جهود رابطة شبكة الويب العالمية في تطوير معايير الويب:

- توافق
- توافق
- توافق
- توافق
- توافق

ينظم العقود المستقلة عن خدمات الحكومة الإلكترونية بória أوراق مستندات عبارة عن معايير رابطة شبكة الويب العالمية:

- توافق
- توافق
- توافق
- توافق

يشار الشكل المرفقETY لمنحة عبارة عن رابطة شبكة الويب العالمية (من خلال مجموعات رابطة عبارة أو خدمات الوصول للعقول):

- توافق
- توافق
- توافق
- توافق

لا يعترن ولا توافق

100%
100%
100%
100%
القسم 2: أسئلة حول إرشادات إتاحة محتوى الويب

في عام 2008 نشِّطت رابطة شبكة الويب العالمية العالمية منظمًا لرعاية إرشادات إتاحة محتوى الويب 2 (WCAG 2.0). ننتج النسخة المستخدمة ذات الحالة الإعاقة، وذات القدرات، وأساليب تطوير نسخ الويب.

WCAG 2.0:

- أوقاف عامة
- أوقاف
- لا أوقاف
- لا اختصار ولا أوقاف

AAA، AA، A (WCAG 2.0):

- أوقاف عامة
- أوقاف
- لا أوقاف
- لا اختصار ولا أوقاف

موجزًا الإلكتروني الحالي من مسند إتاحة إرشادات المستوي من إرشادات إتاحة محتوى الويب 2 (WCAG 2.0):

- أوقاف عامة
- أوقاف
- لا أوقاف
- لا اختصار ولا أوقاف

موجزًا الإلكتروني الحالي مستند إتاحة إرشادات المستوي من إرشادات إتاحة محتوى الويب 2 (WCAG 2.0):

- أوقاف عامة
- أوقاف
- لا أوقاف
- لا اختصار ولا أوقاف

نماذج قصيرة في نموذج شرط إرشادات إتاحة محتوى الويب 2 (WCAG 2.0)
موقعة الإلكتروني حانها مستويات احترامات المستوى A من إرشادات إناجحة محتوى الويب 2.0 (WCAG 2.0):

- توافق عامة
- توافق
- توافق
- أختراع ولا توافق

تواجه صعوبة في فهم شروط إرشادات إناجحة محتوى الويب 2.0 (WCAG 2.0):

- توافق عامة
- توافق
- توافق
- أختراع ولا توافق

ندرك الاختلاف من إرشادات إناجحة محتوى الويب 1.0 (WCAG 1.0) و 2.0 (WCAG 2.0):

- توافق عامة
- توافق
- توافق
- أختراع ولا توافق

لا نخطط حالياً لتطبيق إرشادات إناجحة محتوى الويب 2.0 (WCAG 2.0) في موقعا:

- توافق عامة
- توافق
- توافق
- أختراع ولا توافق

ندرك أن موقعا لا يلزم مطابقة أي من مستويات إرشادات إناجحة محتوى الويب 2.0 (WCAG 2.0):

- توافق
- لـ
- لا
- غير معروف

13. موقعا بني احترامات:

- المستوى A من إرشادات إناجحة محتوى الويب 1.0 (WCAG 1.0)
- المستوى AA من إرشادات إناجحة محتوى الويب 1.0 (WCAG 1.0)
- المستوى A من إرشادات إناجحة محتوى الويب 2.0 (WCAG 2.0)
- المستوى AA من إرشادات إناجحة محتوى الويب 2.0 (WCAG 2.0)
القسم 3: أسئلة حول موقف ووجهة نظر الوكالة والعمالين:

إجابة الويب عبروا عن فكرة توفير صفحة الويب وتنظيمها وصيانة للإطلاع ومستخدمها من بنية من إعدادات
(إذا أمكن تفعيلها في الحركة أو لا، أو صفحات القصص أو صفحات المبادئ أو صفحات المبادئ أو الإعدادات
الذكية أو صفحات التعلم أو الصفحات التي يواجهها من معيق في المبنى). باستخدام وسائل التصميم والمواعي
جستها يمكن توفيره للتنوع حتى من يستخدم برامج وأجهزة متخصصة (بقية مساعدة) للتفاعل مع الويب.

تعتبر أن إجابة الويب ليست ذات أهمية لمؤقتاً:
- توافق نهائياً
- توافق
- لا توافق
- لا أعراض ولا توافق

تعتبر أن من شأن تطبيق الويب تحسين جودة مؤقتاً:
- توافق نهائياً
- توافق
- لا توافق
- لا أعراض ولا توافق

ترى مجموعة صعوبة في تنفيذ إجابة إجابة مستوى الويب (2.0):
- توافق نهائياً
- توافق
- لا توافق
- لا أعراض ولا توافق

يفترض فريق التطور لديها للعربية والمجلة الناشئة عن إجابة الويب:
- توافق نهائياً
- توافق
- لا توافق
- لا أعراض ولا توافق

نحتاج إلى معلومات مخصصة بإجابة الويب يمكنهم تقديمها ويتطلب:
- توافق نهائياً
- توافق
- لا توافق
- لا أعراض ولا توافق
بإمكانك استخدام الإعدادات الوظيفية في الموقع:

مر

لا مر

لا يعرف

هل وسمت الحكومة سياسة أو إرشادات عامة لإمالة الويب؟

مر

لا مر

لا يعرف

وضعت حكومتنا إرشادات ونصائح تشجع منظمات إمالة الويب على نتائج 2.0 (WCAG).

أوافق

لا أوافق

لا أعرف ولا أوافق

سوف يشارك طاقم العمل في الدورات التدريبية المنتشرة حول نتائج الويب:

أوافق عامة

لا أوافق

لا أعرف ولا أوافق

يجب أن هناك عدد قليل من الأعضاء الذين يستجيبون من طبقة خصائص إمالة الويب:

أوافق عامة

لا أوافق

لا أعرف ولا أوافق

لا يوجد أي موظفين تتبع خصائص إمالة الويب على موقع:

أوافق عامة

لا أوافق

لا أعرف ولا أوافق

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معتقد أن هناك عدد قليل من الأشخاص الذين يستخدمون من تطبيق خصائص إتاحة الويب:

- أوافق عمّا
- أوافق
- لا أوافق
- لا أطعن ولا أوافق

لا يوجد موظف متخصص ينفذ خصائص إتاحة الويب على مؤمنا:

- أوافق عمّا
- أوافق
- لا أوافق
- لا أطعن ولا أوافق

تحاول معاونتكم رفع ورفع الموظفين بإعداد المستخدم بنسبة إتاحة الويب:

- أوافق عمّا
- أوافق
- لا أوافق
- لا أطعن ولا أوافق

ما هي التحديات التي تواجهها إعادة الوصول إلى موقعاً؟

- الكتاب
- الوقت
- السياسة
- اللغة
- المحتوى
- غير ذلك

معتقد أن حكومتنا غير مهتمة بتقديم خصائص إتاحة الويب:

- أوافق عمّا
- أوافق
- لا أوافق
- لا أطعن ولا أوافق
القسم 4: أسئلة عن التقنيات المساعدة:

التقنيات المساعدة عبارة عن أجهزة أو برامج تسمح للمستخدمين الذين يعانون من عيالات مختلفة بالتفاعل مع موقع الإنترنت ومتجره. تعد تقنيات ذكرى الشاشة جزءًا من هذه التقنيات حيث تتيح للمستخدمين الذين يعانون من صعوبات البصرية أو ضعف الأداء النظري في الموقع الإقليم على المدى البعيد تفاعليتهم بالموقع باستخدام نموذج البصر المظلي فقط.

لماذا معرفة سبب التقنيات المساعدة:
- 1. توافق
- 2. توافق
- 3. توافق
- 4. توافق
- 5. توافق
- 6. توافق

ليس لدينا علم بأي من تقنيات ذكرى الشاشة التي تدعم اللغة العربية:
- 1. توافق
- 2. توافق
- 3. توافق
- 4. توافق
- 5. توافق
- 6. توافق

لماذا عدم استماع ذكرى الشاشة التي تدعم اللغة العربية:
- 1. نعم. الرجاء التوضيح

أي من تقنيات ذكرى الشاشة الثانية التي تدعم Language:
- 1. NVDA
- 2. كأداة متوفرة المستخدم
- 3. كأداة متوفرة المستخدم
- 4. كأداة متوفرة المستخدم
- 5. كأداة متوفرة المستخدم
- 6. أخرى

أي من أوسع التقنيات المساعدة التالية التي تعززها أي سبب لك التفاعل معها:
- 1. تقنيات ذكرى الشاشة
- 2. تقنيات ذكرى الشاشة
- 3. تقنيات ذكرى الشاشة
- 4. أخرى

استخدم طفلك العمل تقنيات مساعدة لاختيار الوصول للمواقع:
- 1. نعم. الرجاء وضع التقنية المفضلة
- 2. نعم. الرجاء وضع التقنية المفضلة

في الوقت الحالي، كيف ساعدت القسم الذي تعمل به أطفالك من منشآت الإعاقة باستخدام موقع الحكومة الإلكترونية؟
القسم 5: أسئلة تقييم المواقع:

لضمان تلبية المعايير (مثل إرشادات تلبية مستوى الويبر (WCAG 2.0))، يجب استخدام وسائل الاتصال والمدخليات والمعايير لضمان مستوى الرؤية. ويمكن إجراء الاختبار باستخدام أدوات مخصصة لتصنيف المواقع، ويمكن استخدام أدوات أتويج للتعامل مع المواقع من خلال النتائج المقدمة للتأكد من سلامة العمل مع المواقع. كما يمكن استخدامها أيضًا بالأداة التفاعلية مع المواقع لإجراء الاختبار.

أود أني أحقق ما بين وسائل الاتصال والتقنية الأخرى المتابعة؟
- أوافق
- 0
- 0
- 0
- 0
- 0

ما هي الأدوات التفاعلية التي تستخدمها لتصنيف المواقع؟
- WAVE
- SortSite
- Achecker
- OpenWax
- Click to write Choice 5

وأحوال مشكلات عند استخدام أدوات تفاعلية مع المواقع العربية؟
- أوافق عامة
- 0
- 0
- 0
- 0
- 0

هل تعرف أشخاص معاصرين يمكنهم تجربة الموقع؟
- دعم
- 0
- 0

ما هي عملية الوصول البدنية (إن وجدت) التي تستخدمها لمراجعة الموقع؟
واجتىمت مسائل عند استخدام أدوات تفاعلية مع المواقع العربية:

- أوافق
- أوافق
- لا أوافق
- لا أتابع ولا أوافق

هل تعرف أشخاص معينين يمكنهم تجربة المواقع؟

- نعم
- لا

ما هي عملية الوصول اليدوية (إن وجدت) التي تستخدمها لمراجعة المواقع؟

القسم 6: اللغة والموارد:

- عدم وجود موارد إحالة اللغة العربية يجعل عملية التثقيب بالمواقع صعبة
- أوافق
- أوافق
- لا أوافق
- لا أتابع ولا أوافق

- عدم توفر أمثلة على إشارة اللغة العربية يجعل عملية التثقيب بالمواقع صعبة
- أوافق
- أوافق
- لا أوافق
- لا أتابع ولا أوافق

ما هي نسبة العاملين لديك الذين يفكرون في اللغة الإنجليزية وكونها

<table>
<thead>
<tr>
<th>100</th>
<th>90</th>
<th>80</th>
<th>70</th>
<th>60</th>
<th>50</th>
<th>40</th>
<th>30</th>
<th>20</th>
<th>10</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

كيف يحدد العاملين لديك المسؤولين عن تطوير الويب مكان الموارد ومستخدمونها لقيام بأي مهام تطوير الويب?

- أوافق
- أوافق
- لا أوافق
- لا أتابع ولا أوافق

هل تستمتع موسكو ببعضين ذويين تطور علاقات ودودة؟

- نعم
- لا
إذا كانت الإجابة نعم، هل العاملين بها على علم باللغة (أن تعتمدا النصين العربياً والإنجليزية مثلاً) √

إذا كانت الإجابة نعم، هل سيؤدي المستشارين إجراء مشاة إزاحة الويب √

توفر موارد محددة للغة العربية في إرشادات إزاحة محتوى الويب (WCAG 2.0) √

أوافق √
لا أوافق √
لا أوافق أبداً √
لا أتعرض رأي √

القسم 7: الخاتمة

شكرًا لمشاركتك في هذه الدراسة. إذا كنت تحترم أي أفكار أو تعليقات أخرى للمشاركة في هذا البحث تتعلق بخصوص الوصول للمواقع في مسستك، رجاءً زاد التزود في نفسك ألا نساء: 

إذا كنت ترغب في المشاركة في حوار منتشر عبر الهاتف بخصوص هذا المجال السحيل، مرجع الإشارة أبداً: 

عم. الرجاء وضع البريد الإلكتروني وتذكر التواصل معكم √
لا √

نشكركم جزيلاً على المشاركة في هذا البحث - وعلى وفتك الفهم وتقديركم مجودكم.
Appendix 3: Timeline of meeting WCAG 2.0 in Qatar

<table>
<thead>
<tr>
<th>Date</th>
<th>Meeting</th>
<th>Main Objective</th>
<th>Supporting Activities</th>
<th>Key Milestones</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td></td>
<td></td>
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<td>2014</td>
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<td>2018</td>
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<td>2019</td>
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<tr>
<td>2020</td>
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<td></td>
</tr>
</tbody>
</table>

Note: The timeline is placeholders for actual dates and meetings.