EVALUATION OF THE ACCESSIBILITY OF WEBSITES OF MINISTRY OF EDUCATION OF COUNTRIES IN THE WORLD

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EVALUATION OF THE ACCESSIBILITY OF WEBSITES OF MINISTRY OF EDUCATION OF COUNTRIES IN THE WORLD

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This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Science.

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ABSTRACT

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After the massive proliferation to websites around the world, attention is now on how individuals with different types of disability can use these websites and interact with them. The main aim of this study is to investigate the accessibility of education ministry websites in most countries around the world. The countries are classified into four levels according to their level of income, these being low-income, lower-middle income, upper-middle income and high-income. Usability of the websites is analyzed by employing Web Content Accessibility Guidelines (WCAG) 1.0 and 2.0. The EvalAccess 2.0 and TAW tools were used to analyze the accessibility of these websites. The evaluation results of those websites have revealed many accessibility problems regarding violations of WCAG. This study provides some guidelines which should be taken into account when developing a website.

Keywords: Web Accessibility, Disability, E-Government, Web Content Accessibility Guidelines

ÖZ

DÜNYADAKİ ÜLKELERİN EĞİTİM BAKANLIĞI WEBSİTELERİNİN ERİŞİLEBİLİRLİKLERİNİN DEĞERLENDİRİLMESİ

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Websitelerinin yaygınlaşmasında sonra şimdi dikkatler farklı engelleri olan bireylerin bu websitelerini nasıl kullanmalarında ve etkileşim içinde olmalarındadır. Bu çalışmanın temel amacı dünyadaki birçok ülkeye ait eğitim bakanlığı websitelerinin erişebilirliğini araştırmaktır. Ülkeler gelir seviyelerine göre dört seviye altında gruplandırılmıştır. Bunlar düşük gelir, alt-orta, üst-orta ve yüksek gelir grubu ülkelerdir. Web sitelerinin kullanılabilirliği Web Content Accessibility Guidelines (WCAG) 1.0 ve 2.0 ilkelerine göre analiz edilmiştir. Bu değerlendirmede *EvalAccess 2 ve TAW* araçları kullanılmıştır. Değerlendirme sonuçları WCAG ilkelerinin çiğnenerek websitelerinde birçok erişilebilirlik problemlerinin olduğunu açığa çıkarmıştır. Bu çalışma, websitesi geliştirilirken dikkate alınması gereken bazı prensipleri ortaya koymaktadır.

Keywords: Web Erişim, Engellilik, E-Hükümet, Web İçerik Erişim İlkeleri

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LIST OF ABBREVIATIONS

AFB	American Foundation for the Blind
ATAG	Authoring Tools Accessibility Guidelines
DRC	Disability Rights Commission
DRC	Disability Rights Commission
ICT	Information and Communications Technology
IS	Information Society
PDA	Personal Digital Assistant
Section 508	Section 508 of the Rehabilitation Act of 1973 (has been revised since)
UAAG	User Agent Accessibility Guidelines
W3C	World Wide Web Consortium
WAI	Web Accessibility Initiative
WCAG	Web Content Accessibility Guidelines
WHO	World Health Orgnization

CHAPTER 1

INTRODUCTION

At current time, websites play important role in getting information at different fields such as healthcare, commerce and education. Therefore, those websites must be accessible to all types of users including users with disabilities. Accordingly, disabled people should have the opportunity to benefit from any services being provided. According to a report published by WHO, the numbe of disabled people in our world are amounted about more than one billion people [1]. These disabled people may suffer from mental, psychological, physical, intellectual, cognitive, or sensory impairments which may create a difficulty for them and prevent them from participating in all of society's activities as practiced by others [2].

The United Nations Assembly in 2006 [2] reached an agreement that aimed to promote the rights of disabled people. This agreement includes many fields including accessibility to Internet, education and health. The main thrust of the Ninth Article of this agreement is a recommendation that countries determine the obstacles and barriers preventing people with disabilities from accessing to their environment in terms of information technology, transportation, services and public facilities. Recently, the United Nations has expanded these struggles to comprise Internet access to the in Section 2 of the Ninth Article. 187 countries are signatories to this agreement.

This United Nations study concluded that the main reason for disabled peoples' use of the Internet was to access governmental services provided by government websites [3]. Therefore, it is very critical to develop governmental websites by succeeding the web accessibility guidelines (these guidelines will be explained in details at chapter two). This will guarantee that disabled people are able to benefit from any service provided by governmental websites.

The main aim of this study is to analyze the accessibility of education ministry websites in low-income, lower middle-income, upper middle-income and high-income countries. Accessibility was measured by the use of Web Content Accessibility Guidelines (WCAG). The websites accessibility is analyzed using the automatic evaluation tools from *EvalAccess 2.0 and TAW*. Conclusions and recommendations are stated at the end of this study after an in-depth analysis of the results. Existing research conducted in many countries regarding web accessibility in many ortganizations and facilities such as universities and governmental websites are reviewed. Accessibility matters are emphasized for compliance with web accessibility guidelines.

1.1 Statement of the Problem

Education ministry websites in many countries, including the developing and underdeveloped countries, suffer from great problems which create a barrier to using these websites effectively and efficiently. In addition, many of these websites have been designed without having born in mind that they are used by users with different abilities and disabilities, including users with vision problems, blindness, color blindness, and hearing impairments.

1.2 Goal of the Study

The main goal of this study is to determine the accessibility of education ministry websites around the world. The countries are categorized into four groups: low-income, lower middle-income, upper middle-income and high-income countries. Another goal of the study is to test whether the countries levels of income have an influence on the accessibility of education minisitry websites. For instance, it will be interesting to show that the websites of low-income countries have almost same accessibility problems relative to the websites of high-income countries.

1.3 Significance of the Study

Our study is considered significant because to the best of my knowledge no other study to date has evaluated website accessibility within this group of classification. The small number of studies performed in the last few years posed the question as to whether any of the latest high profile studies and investigations in website accessibility

have led to organizational prioritization of website accessibility. The study time is considered unique such that this study uses the web accessibility criterion as used by Thompson et al. (2010) [4]. Moreover, this study delivers a useful agreement on current web accessibility guidelines as compared with those found in the literature. In addition, this study analyzes education ministry websites from around the world according to WCAG 2.0 guidelines and standards. There has hitherto been no other study evaluating accessibility to these specific websites. Variations in website accessibility performance both between and with websites would demonstrate whether differences in website accessibility are of use within an institution. Should disability services offices, which are likely to be smaller and receive less finance than marketing or admissions offices, attain greater performance of accessibility, it would reveal whether website accessibility is a subject of strength, awareness, and education and not a subject of finance.

1.4 Method of the Study

This study uses descriptive statistics and presents the accessibility problems of education ministry websites. The accessibility problems are shown in tables with respect to their frequency. This reveals the most common problems of these websites. In addition, the accessibility problem numbers are compared with respect to income the group (i.e., low-income, lower middle-income, upper middle-income and high-income) of countries. Accessibility is evaluated through the use of the automatic accessibility evaluation tools, EvalAccess 2.0 and TAW, which can be found at the following links *http://sipt07.si.ehu.es/evalaccess2/index.html* and *https://www.tawdis.net*, respectively.

1.5 Research Questions

Our study endeavors to answer the following main questions:

1. Is there an effect of income group (i.e., low-income, lower middle-income, upper middle-income and high-income) of countries on accessibility problems of education ministry websites?
2. What are the most violated accessibility problems of education ministry websites?

1.6 Organization of the Thesis

The thesis involves of six chapters as follows:

Chapter One includes an introduction to the current study in addition to a description of the goals of our study their importance and the general structure of the thesis.

Chapter Two provides a literature review about the study and a comprehensive review of a number of web accessibility evaluations. As well as, it provides the guidelines for web accessibility.

Chapter 3 presents the methodology of the study.

Chapter Four presents the results that have ensued from the study.

Chapter Five includes a discussion on the study results and the violations of the checkpoints made by education ministry websites around the world.

Chapter Six presents the conclusion of the study.

CHAPTER 2

LITERATURE REVIEW

WCAG 2.0 stipulates how web contents made available to all people, especially those people with disabilities that are visual, auditory, physical, logical, cognitive, linguistic, educational and neurological in nature. Despite all of these directives, which consist of a large set of issues, they do not fulfill the people needs who suffer from all the categories of disabilities at a level which prevents them from using this facility. Furthermore, all of these directives are supposed to make web content more usable for the elderly and allow better utilization by traditional users. WCAG 2.0 is established according to the W3C methodology in partnership with organizations and individuals from all the parts of the world in order to provide a mutual framework for web accessibility criterions and fulfill the needs of individuals, organizations and governments at an international level. It must be mentioned that WCAG 2.0 has been developed on WCAG 1.0 and designed on the model which makes it compatible with current and next-generation web technologies. Web accessibility is not restricted to the network and websites accessibility and in fact exceeds them to include web browsers and other media. Moreover, editing tools have important role in facilitating the web accessibility.

2.1 Web Accessibility Evaluation

Web accessibility assessment can facilitate evaluating the extent of a disabled person's web use and includes the accessibility to publishing tools and user agents, including browsers, media players and assistive methods. Furthermore, it includes many basic tools and techniques. The web content accessibility assessment in numerous phases appears to guarantee the quality programs. In some regards, this varies from the guarantee of the programs themselves [1].

Web content inclines to change repeatedly while programs are issued in separate versions which are not changing with time. The assessment does not mean the production of web content, but it is necessary to evaluate and monitor web content during its life cycle. This assessment is more significant than the primary assessment. Web content is always issued by non-technical web publishers. For instance, it may be published by employees who use content management systems or other publishing tools which are compatible with source code. Therefore, controlling the content quality of the web becomes a greater challenge as, for example, any user can publish or modify teh wbe content by the use of many tools and software such as wikis, blogs in addition to many collaborative communication channels. Finally, the wb content inclines to be more focused on material of information such as multimedia and texts and they will be displayed to user while the program inclines to be more directed towards functional features and programming logic.

2.1.1 Web Development Life Cycle

The basic steps to develop the web include requirements, design, implementation and operations [1], as shown in Figure 1 [2].

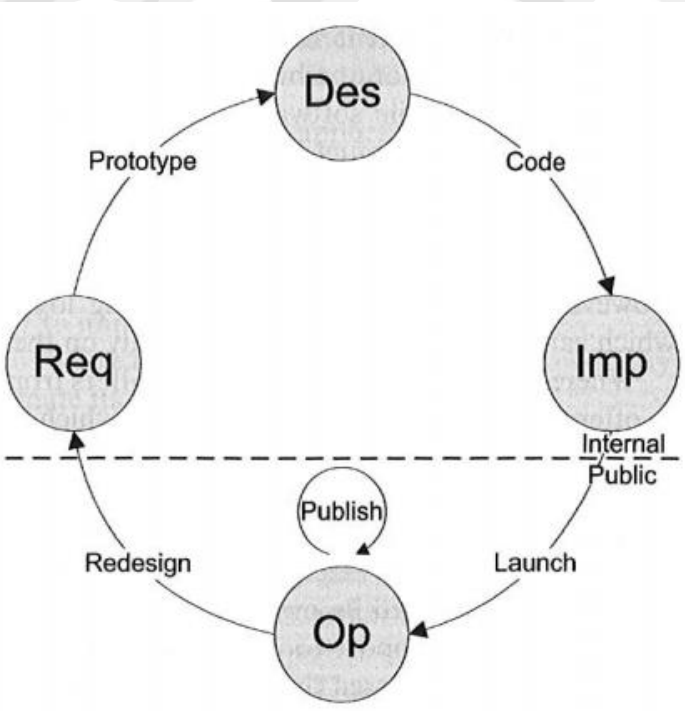

Figure 1: Phases of the Web development life cycle [2]

The steps of web development starts with determining goals and requirements. From the optimal status, the requirements of web accessibility at this early stage are seen as the step which provides time and valuable struggle in processing these requirements at a later time. The first phase is to analyze the requirements of web accessibility for specific web content, including the complete behavior, text and multimedia in responsible how a person who from from disabilities can interact with the web content and understand it. During the design and development phase, functional evaluations must be implemented on the comprehensive design and template concepts, such as, the navigation features, color systems and the general display in the structure of the document. This provides standards and guidelines for web accessibility for disabled people. During the implementation step, the actual accomplishment of the web will start and this step includes the creation of the information content incldluing the multimedia and text. It is significant to appreciate that web accessibility is not the responsibility of only web developoers and technicans but it is the responsibility of web content publishers who need to help in evaluating the infroamtion quality and the way to be disaplyed to the user with many disabilities. If the web content is developed in accordance with web accessibility guidelines, the evaluation which will be implemented during the operating step will aim basically to preserve this quality level and probably determine any further enhancement.

2.1.2 Testing Techniques

Generally, the web accessibility assessment comprises three basc types of testing mechanisms, including the automatic test, which is implemented with special tools, and the manual test, which can be implemented by human evaluators who can be experts or novices. In addition, another technique is the user test [2]. Optimum results can be accomplished by linking these many and different techniques in order to derive advantage from the advantages of each technique. The automatic test is implemented without the need for human involvement and it is considered operative in terms of cost. It can be implemented periodically on large numbers of webpages. At the same time, it addresses the automated test in spite of a number of articles agreeing on most of the standards regarding accessibility. The automatic testing cannot test the judges which tend to be qualitative and fix the user interface and interaction in addition to the sides of the natural language.

Teh human evaluators are implementing the manual test and it is supported sometimes by software tools. For instance, while software tools can speedily check the presence of ALT attributes and IMG components in HTML documents, human assessors must judge the appropriateness of the text in these tags. The user test is implemented by real end-users and not by human assessors or through programming tools. The user test focuses on end-users and the extent of the suitability of the methodical solutions to their needs in exact perspectives. The main problems here are pertain to user selection and the determination of the actual problems that users encounter. Generally, there are two types of user test:

- **Informal tests:** These are tests that can be implemented by non-experts, such as individuals including friends or colleagues being asked about their opinions on websites.
- **Formal tests:** These are implemented by specialists who follow established procedures.

2.2 Guidelines for Web Accessibility

These guidelines aim to encourage good design and web content. The Accessibility Guidelines are considered to be the most important document that covers the problems of accessibility to webpages content. An antiquated misunderstanding states that web design which can be accessed means a very simple webpage design. Moreover, checklist techniques can help web designers and developers to commit to these rules and guidelines.

WAI is published the first version of Web Content Accessibility Guidelines in 1999. Contained in the document are 14 guidelines which stipulate accessibility design principles, each of which include one checkpoint. The checkpoints are ordered on a scale of 1 to 3. Priority 1 techniques are the highest such that it is compulsory for web content developers to do them. For Priority 2, it is advisable for developers to address the points, and for Priority 3 checkpoints, performing them is optional. In addition, there are three conformance levels: A, AA and AAA.

- Level A: All Priority 1 checkpoints have to be satisfied.
- Level AA: All Priority 1 and Priority 2 checkpoints have to be satisfied.
- Level AAA: All Priority 1, 2 and 3 checkpoints have to be satisfied.

The list of Web Content Accessibility Guidelines is summarized and explained in detail in the next chapter (Chapter 3). There are four accessibility principles and each principle includes one or more standards of success [6]. These principles are summarized as follow:

1) Web content must be perceivable.
2) The components of the user interface in the content must be practicable.
3) The web content and controls must be understandable.
4) The web content must be sufficiently robust to operate with present and future technologies.

The standards of success of this model can be organized in the present draft version into three levels of conformance. The second version of WCAG 2.0 is considered better in terms of its operation with different coding languages, while WCAG 1.0 is very HTML specific. In contrast, WCAG 2.0 includes a benefits section which explains the standards of success for people with disabilities. It is published as an official recommendation of W3C.

In this study, the comparison between accessibility in the selected countries will depend on WCAG 1.0 as this standard is used by EvalAccess 2.0 tool (the guidelines are described in detail in the next chapter) and on WCAG 2.0 by the TAW tool.

2.2.1 Non-W3C Guidelines

In order to understand the concept of WCAG and discuss it in details, we should know that in addition to WCAG there are another guidelines which focus partly or entirely on web accessibility. Some of these may be like or even built on WCAG and they may be more noticeable in some societies. An example of this can be found in the IMS Accessibility Guidelines, Standards and Section 508 of the Electronic and Information Technology which is precisely intended for the electronic learning resources [3].
Section 508 and other similar sets of guidelines do not look like Section 508 where there are not strong evidences which support the correctness of each standrds and it must be suggested by the user and more precisely where there are guildines based on researches. In many cases, these studies are developed through studies which include people with disabilities including guidelines use for disabled people that developed by Nielsen and Coyne [4], and guidelines of Web design for users of screen reader [5].

Nevertheless, these studies tend to focus on specific groups instead of focusing on cross-section of disabilities with the existing of prejudice in given advice which may conflict with the demands of other users.

The national institute of cancer which belong to the department of health in the United States produced a set of guidelines for web design and usability on internet including a special department to determine the accessibility according to experts for the purpose of strong existed evidences where each of them support a guideline [6]. The transparency of curriculum guarantee the insertion of resources evidences to each concept of guidelines for researchers seek on trust in the correctness of guidelines and their benefits. However, when analyzed by the researchers with high accuracy such as medicine, these guidelines concepts appeared to be criticized. The authors noticed that non-of these sixty guidelines are supported with high class of supportive evidences even if it is included 12 guidelines (20%) were created completely on opinion [7]. In all of these cases, by comparison with WCAG, it seems that the knowledge of these alternative guidelines are relatively limited between web developers.

2.2.2 Scope and Nature for Web Content Accessibility Guidelines

In 1999, the World Wide Web Consortium has published the W3C's Web Content Accessibility Guidelines (WCAG), Version 1.0 [8]. This set of guidelines is widely known as the actual criterea which through web accessibility is assessed and addresses the issue of web accessibility. WAI developed the principles of WCAG. There are two other guidelines are the Authoring Tools Accessibility Guidelines (ATAG) and the User Agent Accessibility Guidelines (UAAG).

The methodology followed WAI states that the obligation for the web content accessibility deceits with not only on the author of the content but also on the tools which are necessary to access and practice this content (the User Agents) and the tools which are used to generate that content (the Authoring Tools) [9]. WAI techniques refer to global web accessibility that can be accomplished through full compliance in addition to the significant set of guidelines by these entire modules, as shown in Figure 2.

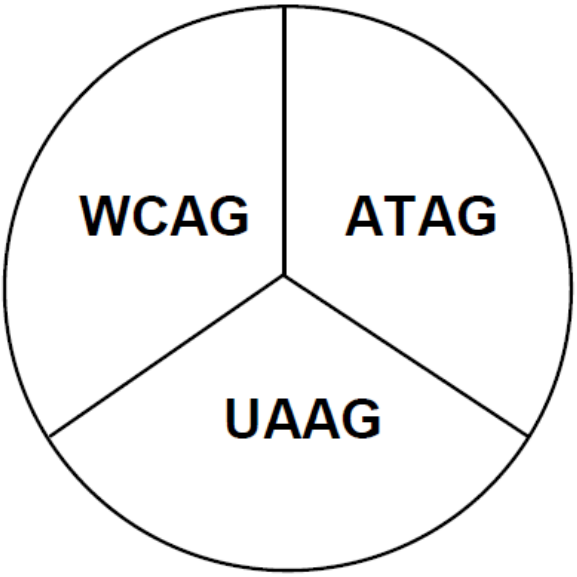

Figure 2: The WAI method of accessibility

The ease of this methodology has successfully aided the WAI to increase accessibility. In fact, the success attested to by web accessibility is deliberated a significant part of the web movement increasing its popularity, as noticed by a number of critics [10]. The main motivation of the task was compatibility with WCAG between a large number of web professionals and the technical quality to their job.

Nevertheless, the study discusses the restrictions with this methodology, which consists of three components. Specifically, it does not reflect the WAI model in a real manner with the varied use of the web technologies and the variety of the end user environment. Moreover, the model depends on the developments of user agents' abilities (such as browsers and technologies used) and the publishing tools, which are out of web publishers' control. The restrictions of the model effect through the implementation issues which associate with WCAG themselves will be discussed in the following section.

2.3 Challenges in Implementation of Web Content Accessibility Guidelines

2.3.1 Theoretical and Closed Nature of the Guidelines

There is great sense that these guidelines are so theoretic and depend highly on the perception of W3C instead of actual experience. WCAG does not particularly provide supporting documentation nor does it provide evidence that mentions the extensive use

of Web formats such as Flash and PDF despite its focus on open W3C technologies including SVG, PNG and RDF. The use of these technologies is particularly restricted, and moderately uncommon applied capabilities are presented. The WCAG age means that the guidelines precede a number of Web technologies currently being widely used. As well as, these guidelines were developed under the W3C's concern to encourage open criteria and knowledge instead of providing guidelines for exclusive techniques. However, there is a risk that the role of WCAG as a prominent source which supports the contents of web that can be accessed is not clear because of the separate goals that are represented in promoting the use of W3C techniques. Moreover, some of them have only useful use outside academic media to recognize the world for the use and ownership of web technologies in a broad area such as organizing the Flash from Adobe/Macromedia, Shockwave and Portable Document Format (PDF). The huge steps which have been taken by the sellers of these techniques to enhance the accessibility to their products has been recognized in spite of the existence of promoted brands such that WCAG version 2.0 allows the broader application to the directional guidelines through both exclusive and open web techniques.

2.3.2 Dependencies on other WAI Guidelines

WAI model which is shown in Figure 1 provides one of the directional guidelines for the correct method. Also, it explains the possibility of access as a collaborative responsibility for web users, developers and assisted techniques in addition to the developers of publishing and distributing the web content. The explained model is considered unnecessary for web publishers as entering enhancements on accessibility support to web browsers and HTML authoring tools are outer their control. Likewise, the WAI model stipulates that during its availability, browsers compatible with UAAG will be depended on helping techniques, multimedia and media players and other applications which can be used by the community of web browsing. For instance, a study was ackmomplished by the Disability Rights Commission (DRC) in 2004 regarding accessibility to websites in the UK.

The survey findings on the WCAG [11] specified that some of the accessibility obstacles found could not be rightly recognized to non-conformance with a precise WCAG checkpoint. WAI replied [12] to state that many obstacles existed due to the non-conformance of browsing technology which was used with the UAAG, signifying

that were Web users to access Web content with UAAG-conformant perusing technology, levels of access difficulties would be concentrated. This may be correct, but it does accept that users can and will adjust their browsing technology. New browsers may accomplish high levels of UAAG conformance and will be taken on by more proficient and proficient Web users. A number of web users will continue the use of browsing with less compatibility and this particularly applied on web browsing who may not interest even in discussing the name of their browsers.

The extensive dependence of UAAG on browsers is considered an appropriate situation and this scenario can be expressed repeatedly by web designers and developers who seek to develop the web standards. However, until this occurs, the model, which relies on the agency of the users who hold responsibility for accessibility, is a very great mistake. Therefore, web publishers may find themselves compelled to expand the functions of the browser in terms of supporting accessibility by adding features inside the page content. For instance, this may be implemented by the addition of characteristics such as style page switchers in order to allow the specialization of the page presence or access to spoken audio versions of web content. These details in the user interface may provide immediate gains in the accessibility with clear effects on the ease of usability.

2.4 WCAG 1.0

WCAG 1.0 delivers guidelines for web designers and developers and its goal is represented in tow sections. The first section aims to help web developers in designing the publishing tools which produce the web usability and accessibility. The publication tools can enable and encourage users ("publishers") in creating a web content which can be accessed through the specifications of audit and reform. It is very important to enable all people to write and understand the content as the case to people which can access. Therefore, the used tools to create this information are accessed themselves. The dependences of these guidelines will help in distribute the web content which can be read by a wider group of readers. This document is a part of accessing tools that published by the W3C Web Accessibility Initiative (WAI) [13].

WCAG 1.0 is considered a standard which is accepted internationally and comprises of 14 guidelines which deliver features about how to develop wbesites that can be

accessed. These guidelines are separated into 14 checkpoints with three priorities denoted 1, 2 and 3. Priority 1 is considered the most important. The number of checkpoints between the guidelines differ. These checkpoints and their number will be explicated in detail in the next chapter (Chapter 3). Each guideline principle consists of one or more checkpoints and there are 65 checkpoints in total. The checkpoints can be classified into three levels according to the same guideline principles into different guideline principles as follows [[14]:

Priority 1 (16 checkpoints): The checkpoints that must be satisfied by web developers are specified as Priority 1; else, it will be hard for users to access any information in a document. This checkpoint is considered one of the basic requirements for a number of group of users to be able to use a website document.

Priority 2 (30 checkpoints): Web developers should satisfy the checkpoints mentioned as Priority 2; otherwise, it will be difficult for some groups of users to access any information in a document. Satisfaction of this checkpoint will lead to the removal of great obstacles causing inaccessibility to web documents.

Priority 3 (19 checkpoints): A web developer may address this checkpoint; otherwise, it becomes somewhat difficult for a group of users to access web documents and the satisfaction of this checkpoint will lead to enhancing the accessibility of web documents.

2.5 WCAG 2.0

The guidelines required when designing websites led to the development of W3C for a new standard. WCAG 2.0 was developed according to four values which state that the websites must be robust, understandable, operable and perceivable [15]. Moreover, WCAG 2.0 does not remove the increased list for the checkpoints, but it offers an operable framework for web developers. There is an important difference between the list on how to make access to websites current. It is possible to tell web developers about technologies under development. This explains how is difficult to differ the technology which means it is difficult to differ if it has not existed until now, especially when looking at the speed at which the new technology is being developed. As an example of the speed of computing development, the use of smart phones has become common in the present time, but Section 508 Regulations became valid six years before the first iPhone. Thus, while even WCAG 2.0 will possibly need to be

modernized in the future, its basic outline can notify web designers and engineers constructing the future Internet.

Perceivable: This refers to the concept that all users can perceive web content. It is known that different users can use different senses in order to access web content. Therefore, web content must be visible and useable under different conditions. Visual content must be organized in a manner which allows people with disabilities and the blind to use it successfully and the audio materials must be in a form which permits individuals which have problems in hearing to listen to it.

Operable: This criterion points to accessibility to web content including moving through lists, links and controlling elements. Moreover, web content must be operable in different ways. For instance, an individual with limited movement, is blind or has weakness of vision would control a computer with the keyboard or his voice without the use of mouse.

Understandable: This points to the ease of use and the ease of use in accessing the web content. The content of web and its operations interface must be understandable.

Robust: The fourth and final principle is that the web content must be strong and reliable and this means that the user must be able to access it across programs and devices which change continuously. In other words, when web browsers are updated or different applications and additional components are used, the content should be interpreted. It is always required by individuals who use accessive techniques to use old operating systems which should remain compatible with screen readers or other assistance techniques [16].

2.6 The Difference Between WCAG 2.0 and WCAG 1.0

The technology is considered a fickle field where it is changed the way we interact and communicate with this world. However, in fact both consumers and developers are always playing the "catch-up" with technological development especially in terms of internet. This development leaves us disappointed in what we own. At the same time, we struggle the change at the world of internet. One of the prominent examples of this transformation is the development which occurred on Web Content Accessibility Guidelines (WCAG) 1.0 to WCAG 2.0.

WCAG 1.0 is published in 1999 and it is a set of guidelines in order to make the web content accessible by user especially those with disabilities. WCAG 1.0 consists of fourteen guideline and number of different checkpoints in order to determine how to reach the web content. All of these checkpoints have a level of priority which can be summarized as follow:

- **Priority 1 (16 checkpoints):** The checkpoints that must be satisfied by web developers are specified as Priority 1; else, it will be hard for users to access any information in a document. This checkpoint is considered one of the basic requirements for a number of group of users to be able to use a website document.
- **Priority 2 (30 checkpoints):** Web developers should satisfy the checkpoints mentioned as Priority 2; otherwise, it will be difficult for some groups of users to access any information in a document. Satisfaction of this checkpoint will lead to the removal of great obstacles causing inaccessibility to web documents.
- **Priority 3 (19 checkpoints):** A web developer may address this checkpoint; otherwise, it becomes somewhat difficult for a group of users to access web documents and the satisfaction of this checkpoint will lead to enhancing the accessibility of web documents.

Moreover, WCAG 1.0 consists of levels of compatibility which refer to how to develop the web content accurately and at the same time it must take into consideration the following points:

- Conformance Level A: All Priority 1 Checkpoints are satisfied.
- Conformance Level AA: All Priority 1 and 2 Checkpoints are satisfied.
- Conformance Level AAA: All priority 1, 2, and 2 Checkpoints are satisfied.

Originally, WCAG 1.0 is issued by W3C where it is International Standard Association for internet. Until the end of 2008, WCAG 1.0 was considered the gold standard for web accessibility. However, the rapid development at technology effected negatively on WCAG 1.0 and started to decrease. Some checkpoints became non-associate with

the technological directed to people with disabilities and some of them were not compatible with new software. There was a need to change the accessibility rules. So, WCAG 2.0 is existed and represents a basic transformation in the philosophy of WCAG 1.0. Whereas WCAG 1.0 is focused on compatibility in order to reach into accessibility.

This makes intelligence: software, hardware and technology all progress, but the important accessibility problems for persons with disabilities stay endless. Therefore, WCAG 2.0 varies from WCAG 1.0 in that WCAG 2.0 emphases on four accessibility principles:

- **Perceivable:** Components of information and user interface must be personable to users in ways they can observe.
- **Operable:** Components of user interface and navigation must be operable.
- **Understandable:** Operation of user interface and information and the must be understandable.
- **Robust:** Content must be robust adequate that it can be understood consistently by a wide variation of user agents comprising assistive technology.

This basic system from W3C comprises guidelines by focusing on the final results and not on specific steps necessary to achieve that. This allows WCAG 2.0 to stay on its importance even with the development of technology.

While it is certainly an important step that promote compatibility with web accessibility, where does WCAG 2.0 leave web developers and programmers who participated in compatible to WCAG 1.0 protocols? At the current time, the websites do not include great differences which not entirely compatible with WCAG 1.0. Nevertheless, WCAG 2.0 differs from WCAG 1.0 in the fact that the update responsibility are always on programmers and developers. For instance, they cannot discuss that the best practices provided by WCAG 1.0 are not compatible with their website or operating systems. Thus, it is up to the individuals generating online web content to figure out how to reach passivity [17]

2.7 Disabilities Affecting Computer Use

Decreasing value can be, for instance, the lower limbs loss which leads to the inability to walk. A disability is a barrier caused by a gap between personal ability and environmental demands. Disabled people can be definite as those finding themselves in a disabling situation. At this point and in subsequent steps, we describe the types of disabilities, especially those which affect computer use. Disability occurs more among the elderly who always encounter many disabilities, such as in hearing or vision, or perhaps both.

By the time the time of implementing this study, there had been no acceptable classifications of disability in spite of the efforts having been spent to achieve this goal. One of the modes in designing the technology is represented by classifying the four groups of natural disability associated with hearing, vision, physical characteristics and reasoning. Abilities differ from one person to another and also for different people with the same disability type. Aging always rises from the number and strength of the restrictions. There are numerous people with different types of disabilities and they do not consider themselves disabled. A significant point of view is that people with disabilities do not appear as a marginal group in the field of accessibility. In particular, the actual minority are the young with their mental and personal strength without any disease, fatigue or disturbance. By looking at all of the age categories ranging from infants to the elderly, there is a larger number of people who face greater challenges than those who do not suffer from any disability or disease [18].

A deaf person can be defined as one who has a weakness in hearing. A person who has a lower hearing degree may be more precisely entitled hard-of-hearing. 'Hearing impaired' is a more medical sounding term which is not as frequently used. It must be mentioned that people who suffer from hearing problems number more than 80 million around the world and they encounter many problems, including the difficulty of using public phones in public places. They do not consider themselves disabled and they are not registered in this regard. Their hearing problems do not impede their use of computers in general as computer devices are normally silent and most interactions with them are visual with only a small number of websites using voice interactivity. Nevertheless, multimedia applications, such as those employing video, must provide captions or written alternatives for hearing impaired people.

A blind person can be defined as one who has great weakness in vision. A person who experiences a low vision degree may more precisely be called visually impaired. A person with low vision is practically the same as one who is visually impaired. There are estimations that about only 10% of persons with any kind of visual impairment read Braille. Moreover, in Europe there are approximately 1.1 million blind people and 11.5 million persons suffering from low vision. However, this number does not comprise people who use glasses. Nevertheless, it is possible to benefit from increasing the text size on the computer screen. The loss of vision has negative effects on the ability to use a computer. The DRC (2004) in UK has conducted many accessibility examinations on many impaired vision groups and found that some blind users clearly faced the greatest difficulties in using public websites. Impairment of movement means difficulty in moving any part of the human body. The impairment of skill is any reduced function to the hands and arms, which makes it difficult, for instance, to use a computer mouse with any precision.

This necessitates that users be able to access and use a web page with the keyboard or a specialized mouse. The movement barriers are so hard in accessing the physical environment. The design of internet service will provide a design which through many opportunities can be reached including an electronic bank solutions that can be accessed easily. This will allow the old people who suffer from movement difficulties to conduct their bank procedures easily.

A famous instance is dyslexia, which reasons misunderstanding in reading and some other tasks. Text on websites must be as understandable and clear as possible, which not only helps disabilities due to dyslexia but facilitates reading for everybody. Cognition and learning difficulties affect an important group of users, which in turn have many effects on the use of computers. Moreover, the selection of a user with a group of users is a difficult matter. The level and effect of the difficulty is not exactly similar. One of the most important accessibility guidelines is to avoid the flickering content on websites causing incidences of seizures for people [19].

2.7 Assistance for the Disabled in Computer Use

The use of computers can be highly affected by disabilities. Therefore, some people need adopted technologies and some need better designed programs and websites. Other disabilities have no effect on the use of computers at all. There are many terms

in the field of disability technologies which refer to devices or program interfaces that assist disabled users and every term has basically the same meaning. For instance, assisted technology, accessibility systems, computing and adopted technologies and other examples of these can be illustrated as follows [20]:

- Blind people can use an artificial or digital voice or a Braille display in order to read content.
- Magnification of the screen and large texts are basically useful to the people who suffer from diminished vision or dyslexia.
- Deaf people or people suffering from hearing disabilities can use descriptive texts and captioning and visual files to understand any multimedia and heard content.
- Specialized adaptations are possible for people who suffer from physical disabilities, including the use of keyboards or voice recognition machines, mice or any input device requiring a part of the body not including hands or fingers to control web browsers.

Assistive technologies help disabled people to use computers, but it is possible that problems may occur because of the lack of a technical design. The web content witnesses many practices in its development that promote compatibility with assistive techniques and different browsers and users. This is called accessibility into a web content. All parties are collected in the guidelines which facilitates the web accessibility including WAI. Web accessibility standardization is discussed in further detail in Chapter 3.

The web accessibility guidelines and principles aim to enable web developers in order to make website which is compatible with all of the techniques that are compatible with the criteria. Thus, It is common that web designers and developers do not enforce to know how to display the assisted or adopted devices on websites. The significant point is to ensure that websites operate according to the associated standards. There are criticisms because the web accessibility guidelines do not suffice for real access. For instance, AFB mentioned that commitment to the accessibility guidelines is important but it is not appropriate for the users to access what they need. It has been confirmed that the misuse by users with disabilities presents problems in the use of the

websites. As a result, disabled users must be requested to enter the users' test in order to enhance the ease of use and web accessibility.

DRC [21] has reached a related conclusion in their study in 2004, which states that 45% of the problems encountered by disabled users on the websites cannot be considered explicit violations to the checkpoints which relate to the initiative of web accessibility. The Republic of Congo suggests enhancements to the guidelines and standards for the web accessibility intuitive. However, most of the suggestions of the Republic of Congo are recommendations based on web accessibility or they can be considered to be user guidelines.

2.8 Difference Between Usability and Accessibility

As mentioned at previous section of this chapter, web accessibility, designs for everybody or general design mean the design which can be accessible by everybody. The solutions of accessibility strive for corporate engineering comprising the whole groups of users. This is the main difference between the ease of use and ease of access. Usability requires the determination of the user, environment and task specifications while the common factor lies in the accessibility. it is common that each of accessibility and usability are both work in order to facilitate the use of websites for users and each of the sides in both of them perform that without the interference of other field. For instance, The separation of content from the presentation must not lead to decrease the usability or provide shortcuts for users with experience and do not prevent the use of another user [22] [23]. Moreover, accessibility and usability are associated with each other. Some specialists say that accessibility is a part of usability, while others may describe it in the reverse manner. A study [24] approximated that 40% of accessibility guidelines enhance usability. For instance, a technically accessible but difficult to use (i.e., not usable) web page is not actually accessible for people with learning difficulties. This means it cannot be used. On the other hand, it is not possible to access a website that can be used easily for professional users as it can be used by beginners or disabled users.

In practice, usability can be considered a technical design to reduce the barriers to use. Thus, usability covers the entire user experiment as defenders of other usability. This tends to confirm that users differ and a group of different users will be served by user

interfaces perfectly. Therefore, it is suggested that a website may include separate versions and there is doubt about the possibility of the optimal use of uniquely designed pages. On other hand, those defending accessibility always use separate copies of texts because in many cases alternative copies can be discriminatory where the text copies of a website are less comprehensive and include fewer updates [25]. Moreover, the availability of discriminatory websites can serve all users and such sites become more effective in terms of the costs of the provision of separate versions.

2.9 Web Accessibility Testing

The accessibility to the web content is tested by using two main methods. The oldest one is to test the accessibility by using browsers and text editors. The best one of them is represented by the modern method in using the automatic web accessibility tools as illustrated in the following sections. The benefits of the two curriculum will be discovered and suggest how to collect between each of the methods to achieve better results in shorter period of time.

2.9.1 Manual Accessibility Testing

The manual testing is considered one of the safest methods to determine the accessibility to the web content. The accuracy of results depend only on the knowledge of tester. The operations includes a comprehensive understand for software instructions on the agent computer device. This code is known in most web browsers. The tester checks the body of the page and review the code when necessary. The manual test allows to find the web accessibility problems by finding the web accessibility which cannot be found programmatically. For instance, the test tool can determine if the image contains on associated descriptive text but during the manual test, it is possible to determine if the description provides adequate information about the image. This test requires an accurate general review especially in case of large websites that guarantee the coverage of all pages and elements.

2.9.2 Automatic Accessibility Testing

The automatic test may provide much faster an initial evaluation and gives a god idea about web accessibility to websites on wider way. Moreover, whenever each page in the websites are associated, the tester does not need to worry about losing any websites

while it is better to check the results of automatic test when specific problems are repeated many times. When prove the correctness of any problem, the tester can register each action quickly. Nevertheless, there are some problems which cannot be discovered through the automatic test. This depend on standards or guidelines that are tested. For instance, when we make a test in order to examine specific sentence such as HTML or variation of specific colors, the automatic test tools can provide accurate results by 100%. When we try to determine if it is mentioned to some information by using color only, there is no automatic test tool determine that carefully.

2.9.3 The Safest Method

The automatic test must be always completed by conducting a manual test. In spite of that automatic test provides a high amount of time by using automatic tool test, it is necessary to double the checking of results and exclude other problems. Moreover, in spite of that test tool can achieve most of the standards, human is the only person who can know if the website is ease to use for a person who use any assisted technique [26].

2.10 Related Works

In this part of the study, we address research studies which have dealt with accessibility problems of governmental and private websites for many countries. The results obtained and the limitations of the studies during the last period. This topic has been of interest to many researchers, which has motivated us to use this study topic and delve more deeply into it. These studies include the following:

Abu Shawar (2017) presented a scientific paper expounding a method to check the content of educational websites that can be accessed in order to guarantee and measure the extent of their compliance with the standards of current web accessibility. They investigated their application on the educational websites. This would increase the accessibility to educational materials provided by educational institutions. Abu Shawar provided in his paper a sample of electronic websites in selected universities in Jordan in terms of accessibility by comparing them with a number of electronic websites in England and the Arab Region. The results showed that the mistakes in accessing websites in Jordan and the Arab Region do not exceed those mistakes found in England [27].

Akram and Sulaiman (2017) provided a scientific paper in order to evaluate the present literature to regulate issues of accessibility at universities and on governmental websites in Saudi Arabia by reviewing the methodology of the literature. The research was implemented in many scientific databases in order to discover the scientific studies on evaluating web accessibility at a world level and in Saudi Arabia from 2009 to 2017. The results revealed that web accessibility to the Internet is a global issue and that several countries around the world such as Saudi Arabia, face difficulties and challenges in web accessibility. Furthermore, the study does not address the WCAG 1.0 and WCAG 2.0 accessibility guidelines faced by users. Additionally, many guidelines were not effective in avoiding user problems. Nevertheless, the results in this study open a new dimension in web accessibility in order to perform comprehensive research to determine the web accessibility principles in the Saudi Arabian perspective [28].

Wan et al. (2011) presented a scientific paper pertaining to the capabilities of web accessibility in Malaysia for federal and governmental websites using WCAG 1.0. The main goal of the study was to check the ease of use and access to the mentioned websites. Accessibility was measured by using the user guidelines related to Nielson for the loading speed, webpage size and the number of disabled webpages. Web accessibility was measured using WCAG 1.0. The number of sample websites numbered approximately 155, which were selected from state and federal governmental websites available at http://www.malaysia.gov.my. The usability and accessibility of the websites was analyzed using automatic evaluation tools such as Axandra and EvalAccess 2.0. The obtained results discovered the evaluation process through many issues associated with the usability of and accessibility to governmental websites in Malaysia. The study detected a high number of usability (speed and number of broken links) and accessibility problems with the governmental websites in relation to the problems with federal websites. The study offered a number of recommendations in order to enhance the usability of governmental electronic websites [29].

Asmaa et al. (2016) presented a scientific study which aimed to deliver an empirical research to the challenges in the field of improving web accessibility encountered by

web developers for Arabic language versions of university websites in the Kingdom of Saudi Arabia. There were a number of challenges encountered in these websites, including the lack of web accessibility and the negative situation in terms of disability issues. The study presents some recommendations in order to enhance accessibility on Saudi Arabian websites [30].

Karaim and Inal (2017) presented a scientific study which aimed to study and evaluate usability and ease of access to Libyan governmental websites. Ten websites were analyzed according to the standards of accessibility to and ease of use of the web content. One website was selected to perform further analysis according to usability standards. The results detected that the website being assessed had many usability problems and half of the problems were classified as being great and catastrophic. The visibility of system status, regulator and helping users to identify and diagnose mistakes represents some of the most violated of heuristic items. Accessibility was not implemented by every governmental website using the AChecker tool. Excluding the Management of Scholarships website, all had failed with the use of the TAW tool. The provision of text alternatives for each non-text item was the most important standard of success and the most violated on Libyan governmental websites [31].

Shi (2006) presented an article to check the accessibility to the regional governmental websites in China as well as websites on the state level in Australia in December 2004 and September 2005. The researcher found that there were critical problems in accessing governmental websites for the Chinese Government in the first test and the situation was worse in the second test. This showed that there were no efforts spent on constructing governmental websites in China. For the Australian Government and in spite of its good performance in general in terms of accessibility, a number of errors were discovered in the first test. These were not overcome in the second test. This means that more efforts are required for Australian websites. By comparing between China and Australia, some valuable lessons can be learned to develop websites by the Chinese government, which should facilitate access for disabled people [32].

CHAPTER 3

METHOD AND MATERIALS

In this chapter, we describe the methods that we followed to conduct this study in order to process the research questions mentioned in Chapter 1. The research questions mentioned in this study need modes involved in evaluating websites used by disabled users. These websites and their accessibility were audited by web accessibility experts using technical guidelines, the modes of which are offered in this chapter.

3.1 Method

— **Priorities of WCAG 1.0**

Priority 1 (16 checkpoints): The checkpoints that must be satisfied by web developers are specified as Priority 1; else, it will be hard for users to access any information in a document. This checkpoint is considered one of the basic requirements for a number of group of users to be able to use a website document.
Priority 2 (30 checkpoints): Web developers should satisfy the checkpoints mentioned as Priority 2; otherwise, it will be difficult for some groups of users to access any information in a document. Satisfaction of this checkpoint will lead to the removal of great obstacles causing inaccessibility to web documents.
Priority 3 (19 checkpoints): A web developer may address this checkpoint; otherwise, it becomes somewhat difficult for a group of users to access web documents and the satisfaction of this checkpoint will lead to enhancing the accessibility of web documents. These priorities are explained in Table 1.

Table 1: The three priorities of WCAG 1.0 with their checkpoints [37]

Priority 1
1.1 Provide a text equivalent for every non-text element (e.g., via "alt", "longdesc", or in element content). This comprises images, graphical representations of text (including symbols), image map regions, animations (e.g., animated GIFs), applets and programmatic objects, ASCII art, frames, scripts, images used as list bullets, spacers, graphical buttons, sounds (played with or without user interaction), stand-alone audio files, audio tracks of video and video.
2.1 Ensure that all information conveyed with color is also available without color, for example from context or markup.
4.1 Clearly identify changes in the natural language of a document's text and any text equivalents (e.g., captions).
6.1 Organize documents so they may be read without style sheets. For example, when an HTML document is rendered without associated style sheets, it must still be possible to read the document.
6.2 Ensure that equivalents for dynamic content are updated when the dynamic content changes.
7.1 Until user agents allow users to control flickering, avoid causing the screen to flicker.
14.1 Use the clearest and simplest language appropriate for a site's content. ***And if you use images and image maps (Priority 1)***

1.2 Provide redundant text links for each active region of a server-side image map.
9.1 Provide client-side image maps instead of server-side image maps except where the regions cannot be defined with an available geometric shape. ***And if you use tables (Priority 1)***
5.1 For data tables, identify row and column headers.
5.2 For data tables that have two or more logical levels of row or column headers, use markup to associate data cells and header cells. ***And if you use frames (Priority 1)***
12.1 Title each frame to facilitate frame identification and navigation. ***And if you use applets and scripts (Priority 1)***

6.3 Ensure that pages are usable when scripts, applets, or other programmatic objects are turned off or not supported. If this is not possible, provide equivalent information on an alternative accessible page. ***And if you use multimedia (Priority 1)***
1.3 Until user agents can automatically read aloud the text equivalent of a visual track, provide an auditory description of the important information of the visual track of a multimedia presentation.
1.4 For any time-based multimedia presentation (e.g., a movie or animation), synchronize equivalent alternatives (e.g., captions or auditory descriptions of the visual track) with the presentation. ***And if all else fails (Priority 1)***
11.4 If, after best efforts, you cannot create an accessible page, provide a link to an alternative page that uses W3C technologies, is accessible, has equivalent information (or functionality), and is updated as often as the inaccessible (original) page.

Priority 2
2.2 Ensure that foreground and background color combinations provide sufficient contrast when viewed by someone having color deficits or when viewed on a black and white screen. [Priority 2 for images, Priority 3 for text].
3.1 When an appropriate markup language exists, use markup rather than images to convey information.
3.2 Create documents that validate to published formal grammars.
3.3 Use style sheets to control layout and presentation.
3.4 Use relative rather than absolute units in markup language attribute values and style sheet property values.

3.5 Use header elements to convey document structure and use them according to specification.
3.6 Mark up lists and list items properly.
3.7 Mark up quotations. Do not use quotation markup for formatting effects such as indentation.
6.5 Ensure that dynamic content is accessible or provide an alternative presentation or page.
7.2 Until user agents allow users to control blinking, avoid causing content to blink (i.e., change presentation at a regular rate, such as turning on and off).
7.4 Until user agents provide the ability to stop the refresh, do not create periodically auto-refreshing pages.

7.5 Until user agents provide the ability to stop auto-redirect, do not use markup to redirect pages automatically. Instead, configure the server to perform redirects.
10.1 Until user agents allow users to turn off spawned windows, do not cause pop-ups or other windows to appear and do not change the current window without informing the user.
11.1 Use W3C technologies when they are available and appropriate for a task and use the latest versions when supported.
11.2 Avoid deprecated features of W3C technologies.
12.3 Divide large blocks of information into more manageable groups where natural and appropriate.
13.1 Clearly identify the target of each link.
13.2 Provide metadata to add semantic information to pages and sites.

13.3 Provide information about the general layout of a site (e.g., a site map or table of contents).
13.4 Use navigation mechanisms in a consistent manner. ***And if you use tables (Priority 2)***
5.3 Do not use tables for layout unless the table makes sense when linearized. Otherwise, if the table does not make sense, provide an alternative equivalent (which may be a linearized version).
5.4 If a table is used for layout, do not use any structural markup for the purpose of visual formatting. ***And if you use frames (Priority 2)***
12.2 Describe the purpose of frames and how frames relate to each other if it is not obvious by frame titles alone. ***And if you use forms (Priority 2)***

10.2 Until user agents support explicit associations between labels and form controls, for all form controls with implicitly associated labels, ensure that the label is properly positioned.
12.4 Associate labels explicitly with their controls. ***And if you use applets and scripts (Priority 2)***
6.4 For scripts and applets, ensure that event handlers are input device-independent.
7.3 Until user agents allow users to freeze moving content, avoid movement in pages.

8.1 Make programmatic elements such as scripts and applets directly accessible or compatible with assistive technologies [Priority 1 if functionality is important and not presented elsewhere, otherwise Priority 2.]
9.2 Ensure that any element that has its own interface can be operated in a device-independent manner.
9.3 For scripts, specify logical event handlers rather than device-dependent event handlers.
Priority 3
4.2 Specify the expansion of each abbreviation or acronym in a document where it first occurs.
4.3 Identify the primary natural language of a document.
9.4 Create a logical tab order through links, form controls and objects.

9.4 Create a logical tab order through links, form controls and objects.
9.5 Provide keyboard shortcuts to important links (including those in client-side image maps), form controls, and groups of form controls.
10.5 Until user agents (including assistive technologies) render adjacent links distinctly, include non-link, printable characters (surrounded by spaces) between adjacent links.
11.3 Provide information so that users may receive documents according to their preferences (e.g., language, content type, etc.)
13.5 Provide navigation bars to highlight and give access to the navigation mechanism.
13.6 Group related links, identify the group (for user agents), and until user agents do so, provide a means to bypass the group.

13.7 If search functions are provided, enable different types of search for different skill levels and preferences.
13.8 Place distinguishing information at the beginning of headings, paragraphs, lists, etc.
13.9 Provide information about document collections (i.e., documents comprising multiple pages).
13.10 Provide a means to skip over multi-line ASCII art.
14.2 Supplement text with graphic or auditory presentations where they will facilitate comprehension of the page.
14.3 Create a style of presentation that is consistent across pages.
And if you use images and image maps (Priority 3)
1.5 Until user agents render text equivalents for client-side image map links, provide redundant text links for each active region of a client-side image map.
And if you use tables (Priority 3)
5.5 Provide summaries for tables.
5.6 Provide abbreviations for header labels.
10.3 Until user agents (including assistive technologies) render side-by-side text correctly, provide a linear text alternative (on the current page or some other) for all tables that lay out text in parallel, word-wrapped columns.
And if you use forms (Priority 3)
10.4 Until user agents handle empty controls correctly, include default, place-holding characters in edit boxes and text areas.

— **Design of the Study**

This study uses descriptive statistics and has the goal to reveal the accessibility problems of education ministry websites. The evaluation processes were conducted on the education ministries of the countries in the world. The countries are divided into high-income, upper middle-income, lower middle-income and low-income countries. The accessibility problem numbers are compared with respect to income the group of mentioned countries. The analysis period extended from 25/12/2017 until 5/1/2018 with average of four hours per day. Throughout this period of time, we accessed the various websites following the respective links to each of them. The websites were analyzed using *EvalAccess 2.0 and TAW*, which can be accessed via the following links http://sipt07.si.ehu.es/evalaccess2/index.html and https://www.tawdis.net, respectively.

3.2 Four Levels of Countries

The countries are classified into four categories as stated earlier according to their level of growth as high-income, upper middle-income, lower middle-income and low-income countries. The names of countries in our study are shown in Table 2. This classification is implemented by The World Economic Situation and Prospects, which reflects the basic level of economy for those countries.

Table 2: Countries per capita [38]

High-income		**Upper middle income**		**Lower middle income**	**Low-income**
Australia	Lithuania	Albania	Jordan	Armenia	Bangladesh
Austria	Luxemburg	Algeria	Kazakhstan	Bolivia	Benin
Bahrain	Malta	Angola	Lebanon	Cameroon	Burkina Faso
Barbados	Netherlands	Argentina	Libya	Cape Verde	Burundi
Belgium	New Zealand	Azerbaijan	Malaysia	Congo	Central African Republic
Brunei	Norway	Belarus	Mauritius	Cote d'Ivoire	Chad
Darussalam	Oman	Bosnia and Herzegovina	Mexico	Djibouti	Comoros
Canada	Poland	Botswana	Montenegro	Egypt	Democratic Republic of Congo
Chile	Portugal	Brazil	Panama	El Salvador	Eritrea
Croatia	Qatar	Bulgaria	Peru	Georgia	Ethiopia
Cyprus	Republic of Korea	China	Romania	Guatemala	Gambia
Czech Republic	Russian Federation	Colombia	Peru	Ghana	Ethiopia
Denmark	Saudi Arabia	Costa Rica	South Africa	Honduras	Gambia
Equatorial	Singapore	Cuba	Thailand	India	Haiti

Guinea	Slovak Republic	Dominican Republic	The former Yugoslavia	Indonesia	Kenya
Estonia	Slovenia	Ecuador	Republic of Macedonia	Lesotho	Kyrgyzstan
Finland	Spain	Gabon	Tunisia	Mauritania	Liberia
France	Sweden	Hungary	Turkey	Moldova	Madagascar
Germany	Switzerland	Islamic Republic of Iran	Turkmenistan	Morocco	Malawi
Greece	Taiwan Province			Nicaragua	Mali

3.3 Procedure

Figure 3 illustrates a print screen from our analysis which we conducted on 158 countries using *EvalAccess 2.0*. The countries were analyzed according to WCAG 1.0 as mentioned and analyzed in detail previously. Cells A1 to A58 include the names of countries. Cells B1 to B158 include the address of the ministry of the education of these countries. Cells C1 to C158 are the classification of the countries according to their income and cells D1 to BP1 are the checkpoints which relate to the WCAG system. The fields 0 and 1 represent the analysis which we obtained from *EvalAccess 2.0*, where 0 represents the success of the ministry with this checkpoint, while 1 represents the failure of the ministry to pass this checkpoint. The total of the failed checkpoints we obtained is calculated in cells BP1 to BP158. It must be mentioned that the values in the columns denoted by 1.1, 1.2, 1.3, etc. represent the successes or failures at each site according to the measure of WCAG 1.0 shown in Table 3. TAW was used to analyze the accessibility of 40 countries in total (10 from each income group of the countries) with respect to WCAG 2.0

	A	B	C	D	E	F	G	H	I	J	K	L
1	Name of cuntry	URL of MOE	income level	1.1	1.2	1.3	1.4	1.5	2.1	2.2	3.1	3.2
2	Albania	arsimi.gov.al	2	0	0	0	0	0	0	0	0	0
3	Algeria	education.gov.dz	2	0	0	0	0	0	0	0	0	0
4	Angola	m.portalangop.co.ao	2	1	1	0	0	0	0	0	0	0
5	Argentina	portal.educacion.gov.ar/	2	0	0	0	0	0	0	0	0	0
6	Azerbaijan	edu.gov.az/en	2	1	1	0	0	0	0	0	0	0
7	Belarus	edu.gov.by/en-uk/	2	1	0	0	0	0	0	0	0	0
8	Bosnia and Herzegovina	fbihvlada.gov.ba/	2	1	1	0	0	0	0	0	0	0
9	Botswana	1govportal.imexsystems.net/	2	1	0	0	0	0	0	0	0	0
10	Brazil	mec.gov.br	2	0	0	0	0	0	0	0	0	0
11	Bulgaria	cris.government.bg/public/Locale	2	0	0	0	0	0	0	0	0	0
12	China	english.moe.gov.tw/	2	1	1	0	0	0	0	0	0	0
13	Colombia	mineducacion.gov.co/	2	1	0	0	0	0	0	0	0	0
14	Costa Rica	mep.go.cr/	2	1	0	0	0	0	0	0	0	0
15	Cuba	education.govt.lc/	2	1	0	0	0	0	0	0	0	0
16	Dominican Republic	dominica.gov.dm	2	1	0	0	0	0	0	0	0	0
17	Ecuador	educacion.gob.ec/	2	0	0	0	0	0	0	0	0	0
18	Gabon	globe.gov/web/gabon	2	0	0	0	0	0	0	0	0	0
19	Hungary	nefmi.gov.hu/	2	0	0	0	0	0	0	0	0	0
20	Iran, Islamic Republic	msrt.ir/en	2	0	0	0	0	0	0	0	0	0
21	Iraq	irandataportal.syr.edu/ministry-of-education	2	1	0	0	0	0	0	0	0	0
22	Jamaica	moe.gov.jm/	2	1	0	0	0	0	0	0	0	0
23	Jordan	moe.gov.jo/en/	2	1	0	0	0	0	0	0	0	0
24	Kazakhstan	government.kz/en/	2	1	1	1	0	0	0	0	0	0
25	Lebanon	gov.uk/government/news/uk	2	0	0	0	0	0	0	0	0	0
26	Libya	mohe.gov.ly/	2	0	0	0	0	0	0	0	0	0

Figure 3: Analysis results of the selected countries

	AZ	BA	BB	BC	BD	BE	BF	BG	BH	BI	BJ	BK	BL	BM	BN	BO	BP	BQ
1	12.1	12.2	12.3	12.4	13.1	13.2	13.3	13.4	13.5	13.6	13.7	13.8	13.9	13.1	14.1	14.2	14.3	Sum
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
6	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	4
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
12	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	5
13	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	6
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
16	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	5
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

Figure 4: Screen showing totals of problems found at each tested site

This assessment evaluates website accessibility by evaluating a subset of criteria common to WCAG 1.0 developed by Thompson et al. (2010) [39].

It seeks to answer the question: *Are research institutions making their website content accessible to users with disabilities?* These criteria also evaluate aspects of accessibility compliance that impact the experiences of individuals with a broad range of disabilities.

CHAPTER 4

WEBSITE ACCESSIBILITY RESULTS

In this chapter, we access to the education ministries of most of the countries in the world. The countries are classified into four groups, namely high-income, upper middle-income, lower middle-income and low-income countries. Web accessibility to each country was analyzed separately and the results have been compared with other countries in the same category. We then analyze the extent of the violation of specific features and we extract some results. Then we move to the next category. Later, we perform a comprehensive comparison of all the countries and mention the feature or features which have been violated by all of them and those which have been passed by all of them. The countries which will be compared are categorized into four groups according to World Economic Situation and Prospects (WESP) as presented in Table 2 (Chapter 3).

An analysis of variance (ANOVA) is run in order to examine whether there exists significant difference on accessibility problems of the web pages with respect to WCAG 1.0 between the groups of the countries. The results of the ANOVA suggest that there exists no significant difference between high-income, upper middle-income, lower middle-income and low-income countries, $F(1, 3) = .32$, $p = 81$.

Web accessibility is also tested by using another tool (TAW), but now websites are analyzed with respect to newer WCAG 1.0. Only 40 countries (10 from each group) were analyzed. The Pearson product-moment correlation coefficient is used in order to examine the correlation between accessibility problems of the websites with WCAG 1.0 by EvalAccess and WCAG 2.0 by TAW. The correlation between the accessibility problems obtained from WCAG 1.0 and WCAG 2.0 is significant, $r = .36$, $p = .02$,

suggesting that there exists a significant correlation between the accessibility results from WCAG 1.0 and WCAG 2.0.

4.1 Low-Income Countries

As shown in Table 3, this category includes 20 countries. However, the countries which were reached numbered 17 and the other three countries could not be reached, these being Burkina Faso, Central African Republic and Chad. Table 4 presents the accessibility analysis and a summary of the violated accessibility checkpoints based on the sampling of the accessed websites.

Table 3: Low-Income Countries

Sequence	Low-Income
1	Bangladesh
2	Benin
3	Burkina Faso (could not be reached)
4	Burundi
5	Central African Republic (could not be reached)
6	Chad (could not be reached)
7	Comoros
8	Democratic Republic of Congo
9	Eritrea
10	Ethiopia
11	Gambia
12	Ethiopia

13	Gambia
14	Haiti
15	Kenya
16	Kyrgyzstan
17	Liberia
18	Madagascar
19	Malawi
20	Mali

Table 4: Accessibility Analysis of Education Ministry Websites of Low-Income Countries

Priority	Checkpoints with HTML Elements and Attributes	Number of Websites Violating This Checkpoint	Total
3	4.3 Identify the primary natural language of a document.	Benin (1)+ Burundi (1)+ Comoros+ Democratic Republic of Congo (1)+ Eritrea+ Ethiopia (1)+ Kenya+ Kyrgyz Republic+ Liberia+ Madagascar+ Malawi (1)+ Mali	12
	5.5 Provide summaries for tables.	Bangladesh + Comoros+ Eritrea+ Haiti+ Kyrgyz Republic+ Liberia	6
1	1.1 Provide a text equivalent for every non-text element	Bangladesh (3) + Comoros (3)+ Haiti (4)+ Kenya (5)+ Kyrgyz Republic (9)+ Liberia (6)	6

2	10.1 Until user agents (allow users to turn off spawned windows)	Eritrea+ Haiti+ Kenya+ Kyrgyz Republic+ Liberia	5
	12.4 Associate labels explicitly with their controls.	Eritrea+ Gambia (1)+ Kenya+ Liberia	4
	3.4Use relative rather than absolute units in markup language attribute values and style sheet property values.	Bangladesh + Haiti+ Kyrgyz Republic	3
	11.2 Avoid deprecated features of W3C technologies.	Burundi (2)+ Eritrea (6)+ Haiti	3
	6.4 For scripts and applets, ensure that event handlers are input device-independent.	Eritrea + Kenya+ Kyrgyz Republic (3)	3
	13.2 Provide metadata to add semantic information to pages and sites.	Kyrgyz Republic+ Madagascar (2)+ Mali (2)	3
3	5.6 Provide abbreviations for header labels.	Eritrea+ Liberia	2
2	7.3 Until user agents	Kyrgyz Republic	1
	12.3 Divide large blocks of information into more	Kyrgyz Republic	1

	manageable groups where natural and appropriate.		

We can see from Table 4 the most violated checkpoints by a large number of countries are the following four checkpoints:

- 4.3 Identify the primary natural language of a document.
- 1.1 Provide a text equivalent for every non-text element
- 5.5 Provide summaries for tables.
- 10.1 Until user agents

As shown in Table 4, every country has violated the checkpoints a number of times. The countries which violated the checkpoints greater number of times include Kyrgyzstan, which violated the checkpoints nine times and the countries which violated the checkpoints the least include Benin, Burundi, Democratic Republic of Congo and Malawi. It must be mentioned that we have no country at this category which did not violate the checkpoints.

Details descriptions of these checkpoints are shown in Table 1 in Chapter 3.

4.2 Lower-Middle Income

At this field we will explain the lower-middle countries. The number of countries under this field are 20 countries. We accessed to the ministry of education for those 20 countries and we explained the checkpoints violated by them in terms of usability and accessibility. Table 5 presents the lower-middle income countries and Table 6 explains the analysis results.

Table 5: Lower-Middle Income Countries

Sequence	Lower-Middle Income
1	Armenia
2	Bolivia
3	Cameroon
4	Cape Verde
5	Congo
6	Cote d'Ivoire
7	Djibouti
8	Egypt
9	El Salvador
10	Georgia
11	Guatemala
12	Ghana
13	Honduras
14	India
15	Indonesia
16	Lesotho
17	Mauritania
18	Moldova
19	Morocco
20	Nicaragua

Table 6: Accessibility Analysis of Education Ministry Websites of Lower-Middle Income Countries

Priority	Checkpoints with HTML Elements and Attributes	Number of Websites Violating This Checkpoint	Total
2	4.3 Identify the primary natural language of a document.	Bolivia+ Cameroon+ Congo(1)+ Cote d'lvoire+ Djibouti+ El Salvador(1)+ Georgia+ Guatemala(1)+ Ghana+ Honduras(1)+ Indonesia+ Lesotho+ Mauritania+ Moldova+ Morocco(1)+ Nicaragua(1)	16
1	1.1 Provide a text equivalent for every non-text element	Bolivia(5)+ Cote d'lvoire(4)+ Djibouti(2)+ Egypt(3)+ Georgia(4)+ Ghana(4)+ India(3)+ Lesotho(5)	8
2	12.4 Associate labels explicitly with their controls.	Armenia(1)+ Bolivia(3)+ Cape Verde(5)+ Cote d'lvoire+ Lesotho (5)	5
	10.1 Until user agents (allow users to turn off spawned windows)	Bolivia+ Cape Verde+ Egypt+ India+ Lesotho	5
	10.2 Until user agents (support explicit associations between labels and form controls)	Cote d'lvoire+ Georgia+ Ghana Egypt+ Moldova(2)	5
	6.4 For scripts and applets, ensure that	Bolivia+ Cape Verde+ Lesotho	3

	event handlers are input device-independent.		
	11.2 Avoid deprecated features of W3C technologies.	Georgia+ Ghana+ India	3
	13.2 Provide metadata to add semantic information to pages and sites.	Cameroon(2)+ Mauritania (2)	2
	3.4 Use relative rather than absolute units in markup language attribute values and style sheet property values.	Cape Verde	1
	13.4 Use navigation mechanisms in a consistent manner.	Indonesia (2)	1
3	5.5 Provide summaries for tables.	Cape Verde	1

It is clear from Table 6 that there are many countries that violated the checkpoints. The most important checkpoints violated by the largest number of countries are listed below:

- 4.3 Identify the primary natural language of a document.

- 1.1 Provide a text equivalent for every non-text element.
- 12.4 Associate labels explicitly with their controls.

It must be mentioned that the countries which have the largest percentage in violating the checkpoints are Bolivia and Cape Verde, which violated the checkpoints five times. In contrast, the countries with the smallest percentages in their violation of the checkpoints numbered four, namely Djibouti, Armenia, Morocco and Nicaragua, all of which violated the checkpoint one time.

Detailed descriptions of these checkpoints are shown in Table 1 in Chapter 3.

4.3 Upper-Middle Income

This list of countries includes more countries than have been mentioned in the previous list, which are the low and lower-middle income. This group contains 38 countries. As explained in Table 7, we accessed the respective education ministries and analyze them using the program previous mentioned and explained. The analysis results are explained in Table 8.

Table 7: Upper-middle income Countries

Sequence	Upper-Middle Income	Sequence	Upper-Middle Income
1	Albania	20	Jordan
2	Algeria	21	Kazakhstan
3	Angola	22	Lebanon
4	Argentina	23	Libya
5	Azerbaijan	24	Malaysia
6	Belarus	25	Mauritius
7	Bosnia and Herzegovina	26	Mexico
8	Botswana	27	Montenegro

9	Brazil	28	Panama
10	Bulgaria	29	Peru
11	China	30	Romania
12	Colombia	31	Peru
13	Costa Rica	32	South Africa
14	Cuba	33	Thailand
15	Dominican Republic	34	The Former Yugoslavia
16	Ecuador	35	Republic of Macedonia
17	Gabon	36	Tunisia
18	Hungary	37	Turkey
19	Iran, Islamic Republic	38	Turkmenistan

Table 8: Accessibility Analysis of Education Ministry Websites for Upper-Middle Income Countries

Priority	Checkpoints with HTML Elements and Attributes	Number of Websites Violating This Checkpoint	Total
3	4.3 Identify the primary natural language of a document.	Albania (1)+ Algeria+ Angola+ Argentina+ Bosnia and Herzegovina+ Botswana+ Bulgaria (1)+ China+ Cuba+ Dominican Republic+ Ecuador (1)+ Gabon (1)+ Hungary (1)+ Iran, Islamic Republic (1)+ Kazakhstan+ Lebanon+ Libya+ Malaysia+ Mauritius+ Mexico+ Peru+ South Africa+ Thailand+ The former Yugoslav+ Tunisia (1)+ Turkey+ Turkmenistan	27
1	1.1 Provide a text equivalent for every non-text element.	Angola (5)+ Azerbaijan (4)+ Belarus (1)+ Bosnia and Herzegovina (5)+ Botswana (4)+ China (5)+ Jordan (1)+ Colombia (6)+ Costa Rica (1)+ Cuba (2)+ Dominican Republic (5)+ Kazakhstan (8)+ South Africa (1)+ The former Yugoslav (1)+ Turkey (4)+ Turkmenistan (2)	16

2	10.1 Until user agents (allow users to turn off spawned windows).	Angola+ Bosnia and Herzegovina+ Botswana+ China+ Colombia (5)+ Dominican Republic (3)+ Mauritius (5)+ Montenegro (5)+ Panama (5)+ South Africa+ The former Yugoslav+ Turkey	12
	11.2 Avoid deprecated features of W3C technologies.	Angola+ Argentina (2)+ Bosnia and Herzegovina+ Botswana+ Mauritius+ South Africa+ The former Yugoslav	7
	12.4 Associate labels explicitly with their controls.	Azerbaijan+ China+ Colombia+ Dominican Republic+ Kazakhstan+ Montenegro+ Panama	7
	6.4 For scripts and applets, ensure that event handlers are input device-independent.	Colombia+ Dominican Republic+ Kazakhstan+ Mexico (2)+ Montenegro+ Panama+ South Africa+ The former Yugoslav	7
3	5.5 Provide summaries for tables.	Colombia+ Kazakhstan+ Mauritius+ Montenegro+ Panama+ South Africa	6
2	13.2 Provide metadata to add semantic information to pages and sites.	Algeria (2)+ Lebanon (2)+ Libya (2)+ Malaysia (2)+ Peru (2)+ Thailand (2)	6
1	1.2 Provide redundant text links for each active region of a server-side image map.	Angola+ Azerbaijan+ Bosnia and Herzegovina+ China+ Kazakhstan	5

2	3.4 Use relative rather than absolute units in markup language attribute values and style sheet property values.	Montenegro+ Panama+ South Africa	3
	5.4 If a table is used for layout, do not use any structural markup for the purpose of visual formatting.	The Former Yugoslavia+ Turkey	2
3	5.6 Provide abbreviations for header labels.	Colombia+ Kazakhstan	2
1	1.3 Until user agents	Kazakhstan	1
3	10.4 Until user agents (handle empty controls correctly, include default, place-holding characters in edit boxes and text areas)	Azerbaijan	1
2	7.3 Until user agents	Mauritius	1

In the two tables above (Table 7 and Table 8), we list a number of countries which belong to the upper-middle income. These 38 countries make mistakes in their respective education ministry websites. These mistakes vary from country to country and we find large mistakes in some countries and fewer mistakes in others. It must be mentioned that Brazil is the only country has not committed any mistakes on its

education ministry website. In the list below, we mention that largest number of mistakes found on websites of countries, according to the following criteria:

- 4.3 Identify the primary natural language of a document.
- 1.1 Provide a text equivalent for every non-text element.
- 10.1 Until user agents.
- 6.4 For scripts and applets, ensure that event handlers are input device-independent.
- 11.2 Avoid the deprecated features of W3C technologies.

The country with the largest number of checkpoint violations is Kazakhstan, which violated the checkpoints eight times, followed by Columbia with six checkpoint violations. The countries which received the lowest percentages in violating the checkpoints were Belarus, Jordan, Costa Rica, South Africa, the Former Yugoslavia, Albania, Bulgaria, Ecuador, Gabon, Hungary, Iran and Tunisia. These twelve countries received only one violation to the checkpoints and Brazil had no violations.

Detailed descriptions of these checkpoints are shown in Table 1 in Chapter 3.

4.4 High-Income

The largest number of countries are included in this group, which includes 40 countries, as explained in Table 9. We accessed the education ministries of these countries and analyzed their respective violations to the checkpoints explained in Table 1 in Chapter 3. The analysis of these violations is shown in Table 10.

Table 9: High-income Countries

Sequence	High-income	Sequence	High-income
1	Australia	21	Lithuania
2	Austria	22	Luxemburg
3	Bahrain	23	Malta
4	Barbados	24	Netherlands

5	Belgium	25	New Zealand
6	Brunei	26	Norway
7	Darussalam	27	Oman
8	Canada	28	Poland
9	Chile	29	Portugal
10	Croatia	30	Qatar
11	Cyprus	31	Republic of Korea
12	Czech Republic	32	Russian Federation
13	Denmark	33	Saudi Arabia
14	Equatorial	34	Singapore
15	Guinea	35	Slovak Republic
16	Estonia	36	Slovenia
17	Finland	37	Spain
18	France	38	Sweden
19	Germany	39	Switzerland
20	Greece	40	Taiwan Province

Table 10: Accessibility Analysis of Education Ministry Websites in High-Income Countries

Priority	**Checkpoints With HTML Elements and Attributes**	**Number of Websites Violating This Checkpoint**	**Total**
3	4.3 Identify the primary natural	Australia+ Austria+ Bahrain+ Barbados+ Belgium+ Brunei+ Darussalam+ Chile+ Croatia+	28

	language of a document.	Cyprus+ Equatorial+ Estonia+ Finland+ Germany+ Greece+ Malta+ Netherlands+ New Zealand+ Oman+ Poland+ Portugal+ Russian Federation+ Saudi Arabia+ Singapore+ Slovak Republic+ Switzerland+ Taiwan Province	
1	1.1 Provide a text equivalent for every non-text element	Bahrain+ Barbados+ Brunei+ Darussalam+ Cyprus+ Denmark+ Equatorial+ Guinea+ Finland+ France+ Luxemburg+ Malta+ New Zealand+ Norway+ Oman+ Russian Federation+ Slovak Republic+ Spain+ Sweden	19
2	10.1 Until user agents (allow users to turn off spawned windows)	Bahrain+ Barbados+ Brunei+ Darussalam+ Chile+ Cyprus+ Czech Republic+ Finland+ France+ Lithuania+ Luxemburg+ Malta+ New Zealand+ Oman+ Russian Federation+ Slovak Republic+ Slovenia	18
	6.4 For scripts and applets, ensure that event handlers are input device-independent.	Bahrain+ Barbados+ Brunei+ Darussalam+ Czech Republic+ Finland+ France+ Lithuania+ Luxemburg+ Malta+ Norway+ Slovak Republic+ Sweden	13
	12.4 Associate labels explicitly with their controls.	Cyprus+ Czech Republic+ France+ Lithuania+ Luxemburg+ Malta+ Portugal+ Russian Federation+ Slovak	12

		Republic+ Slovenia+ Spain+ Switzerland	
	11.2 Avoid deprecated features of W3C technologies.	Brunei+ Darussalam+ Finland+ Malta+ Netherlands+ Oman+ Portugal+ Russian Federation+ Switzerland	9
	5.5 Provide summaries for tables.	Brunei+ Darussalam+ Cyprus+ Luxemburg+ Malta+ Portugal+ Russian Federation+ Switzerland	9
	3.4 Use relative rather than absolute units in markup language attribute values and style sheet property values.	Brunei+ Darussalam+ Cyprus+ Malta+ Portugal+ Qatar+ Republic of Korea+ Russian Federation	8
	13.2 Provide metadata to add semantic information to pages and sites.	Australia+ Austria+ Belgium+ Croatia+ Germany+ Poland+ Republic of Korea+ Saudi Arabia+ Singapore	9
	13.1 Clearly identify the target of each link.	Bahrain+ Equatorial Guinea	2
	7.3 Until user agents	Croatia	2
	5.6 Provide abbreviations for header labels.	Luxemburg+ Russian Federation	2
1	1.2 Provide redundant text links	Oman	1

	for each active region of a server-side image map.		
2	10.4 Until user agents (handle empty controls correctly, include default, place-holding characters in edit boxes and text areas)	Equatorial	1

Table 9 explains the countries belonging in the high-income category which includes 40 countries as mentioned previously. Table 10 presents a detailed analysis of the respective education ministry websites of these countries. The number and percentage of violations of the checkpoints of each country differs from country to country. There is only one country which did not show any violation to the checkpoints, namely Canada. The following list includes the checkpoints that were violated by the largest number of countries:

- 4.3 Identify the primary natural language of a document.
- 1.1 Provide a text equivalent for every non-text element.
- 10.1 Until user agents.
- 6.4 For scripts and applets, ensure that event handlers are input device-independent.
- 12.4 Associate labels explicitly with their controls.

It must be mentioned that the countries which registered the largest number of violations to the checkpoints are Malta and Russian Federation with eight violations for each one of them followed by Brunei and Darussalam with seven violations to the checkpoints for each of them, while the countries which received the lowest number of violations were Equatorial Guinea, Estonia, Greece and Taiwan Province, with one

violation to the checkpoints for each of them. Moreover, as stated previously, only Canada does not include violations to any checkpoints.

Detailed descriptions of these checkpoints are shown in Table 1 in Chapter 3.

CHAPTER 5

DISCUSSION

WCAG 1.0 are a set of recommendations which can facilitate accessibility to web content, including for persons with disabilities such as blind, visually impaired, limited cognitive, minors of movement, persons with speech difficulties and sensitivity to light as well those who experience more than one of these disabilities. Taking these guidelines into account can facilitate the use of web for all people in general. The guidelines are written in the form of data which can be tested and do not belong in a category of special technology. The guidelines are inserted into separated documents on how to take into consideration the success criteria in special technology and general information about the explanation of the success factors.

In spite of all these guidelines including a broad set of issues, they do not fulfill the needs of every type of disability. It must be mentioned that these guidelines make the web content more usable for older individuals and users in general use it more. WCAG 1.0 has been developed according to W3C methodology with the collaboration of individuals and organizations from all parts of the world in order to develop these individuals, organizations and governments at an international level. These technologies are designed in a form which is compatible with different current and next generation web technologies in general must be tested manually and automatically. Web accessibility stops not only at accessing content; it exceeds it to include the ability to access the browsers and other used media. Moreover, determination tools play important role in facilitating web accessibility.

The users of WCAG 1.0 are varied and include website designers and developers, political design makers, purchasers, teachers and students. In order to fulfill the needs of these parties, there are many levels and directions that have been placed, including

great principles and general directions as well as successful criteria that can be tested and a set of recommended techniques and common mistakes that are attached to examples, links and source code. These levels can be summarized thus:

- **Principles:** These provide the main foundations of the ability of web access which can be realized and used, as well as the ability of understanding and flexibility.
- **Guidelines:** Under the principles, the guidelines exist as 12 guidelines. These guidelines represent the base goals which must be taken into consideration by web designers and developers in order to facilitate access to web content and its use by people with different disabilities.
- **Success criteria:** The success criteria can be tested according to each guideline and they enable the use of WCAG 1.0 where the requirements and the compatibility test become necessary in the specification of design, purchase, modification and contractual agreements. In order to respond to the needs of different teams in different situations, there are three levels assigned for the purpose of compatibility.
- **Adequate and recommended techniques:** For each of the guidelines and success standards in the document of WCAG 1.0 itself, team work provides a number of techniques. These techniques are informational and there are two types, the first of which are the adequate techniques to the success criteria and other recommended criteria.

Ensuring accessibility and usability must be one of the basic services for any website in order to facilitate services for all the people who visit that website regardless of their age, level of education so as to serve those who especially suffer from any type of disability where these services must be the basics of the provided service from e-government. Therefore, there is a need to raise the level of awareness towards increasing accessibility and usability to all people, especially those people with disabilities. The analyses which we have presented clarifies the existing problems on education ministry websites in most countries and even if they are not major problems, they exist and must be solved in order to facilitate efficient use. The results show that

the violations to the checkpoints exist in most countries regardless of their level of income. Moreover, there was little variation between each level.

The analysis of the low-income countries showed that the greatest number of checkpoints that has been violated by a larger number of countries is Checkpoint 4.3 (by identifying the primary natural language of a document) where it is violated by the following countries: Benin, Burundi, Comoros, Democratic Republic of Congo, Eritrea, Ethiopia, Kenya, Kyrgyzstan, Liberia, Madagascar, Malawi and Mali, which numbers 12 countries in total.

This refers to the lack of interest by these website designers and developers at this checkpoint and it was not taken into consideration during the design and development phases. In addition, the analysis of the lower-middle income countries also included 20 countries where it is similarly referred that the most violated checkpoint is 4.3 (Identify the primary natural language of a document), which was violated by 16 of the 20 countries; these countries include Bolivia, Cameroon, Congo, Cote d'Ivoire, Djibouti, El Salvador, Georgia, Guatemala, Ghana, Honduras, Indonesia, Lesotho, Mauritania, Moldova, Morocco and Nicaragua. This result and the previous results indicate to the difficulty of avoiding this checkpoint by web designers and developers responsible for programming these websites. The importance of this checkpoint is to facilitate the phonation or explanation of condensed or foreign text. The upper-middle income group comprises 38 countries with 27 countries violating this checkpoint; these countries were Albania, Algeria, Angola, Argentina, Bosnia and Herzegovina, Botswana, Bulgaria, China, Cuba, Dominican Republic, Ecuador, Gabon, Hungary, Iran, Kazakhstan, Lebanon, Libya, Malaysia, Mauritius, Mexico, Peru, South Africa, Thailand, the Former Yugoslavia, Tunisia, Turkey and Turkmenistan. Finally, high-income countries consisted of 40 countries from which 28 violated the same checkpoint (4.3); these countries include Australia, Austria, Bahrain, Barbados, Belgium, Brunei, Darussalam, Chile, Croatia, Cyprus, Equatorial, Estonia, Finland, Germany, Greece, Malta, Netherlands, New Zealand, Oman, Poland, Portugal, Russian Federation, Saudi Arabia, Singapore, Slovak Republic, Switzerland and Taiwan Province.

After describing the checkpoint violated by the larger number of countries, we will explain the five checkpoints which are violated by most countries in addition to an explanation of the lowest five checkpoints that are violated by the least number of countries.

The most violated checkpoints by all of the levels is Checkpoint 4.3 (Identify the primary natural language of a document), which was violated by 83 countries in all four levels of countries. The correction of this checkpoint is shown in Figure 5 [40]. An example of the violation of this checkpoint is shown in Figure 6, taken from the Ministry of Education in Turkey.

```
<HTML lang="it">
<HEAD></HEAD>
    <BODY>
    <P>Volete sapere l'origine della parola cappuccino,
    il popolare caffelatte all'italiana?</P>
</BODY>
</HTML>
```

Figure 5: Correcting the violation of 4.3 checkpoint

```
<html xmlns="http://www.w3.org/1999/xhtml">
    <head>
        <meta http-equiv="Content-Type" content="text/html; charset=windows-1254"/>
        <meta http-equiv="Content-Type" content="text/html; charset=iso-8859-9"/>
        <meta http-equiv="X-UA-Compatible" content="IE=Edge" />
        <meta name="viewport" content="width=device-width, initial-scale=1">
        <meta name="description" content="T.C. Milli Eğitim Bakanlığı" />
        <meta name="keywords" content="MEB,e-okul,mebbis,öğretmen,öğrenci,atama,eğitim,sınav,burs
        <meta name="author" content="T.C. Millî Eğitim Bakanlığı Bilgi İşlem Dairesi Başkanlığı İ
Daire Başkanlığı" />
        <link rel="shortcut icon" href="/image/meb_logo.png" type="image/png" />
        <link rel="stylesheet" href="font/font.css" type="text/css" />
        <link rel="stylesheet" href="css/style.css" type="text/css" media="screen" />
        <link rel="stylesheet" href="css/prettyPhoto.css" type="text/css" />
        <!--<link rel="stylesheet" href="css/styles/jplayer.css" type="text/css" />-->
        <link rel="stylesheet" href="css/styles/jquery.clockstone.css" type="text/css" />
        <!--[if lt IE 9]>
            <link rel="stylesheet" href="css/styles/ie.css" type="text/css" />
        <![endif]-->
        <link rel="stylesheet" href="css/slider.css" type="text/css" media="screen" />
        <link rel="stylesheet" href="css/menu.css" >
        <link rel="stylesheet" href="css/style1.css" >
        <link rel="stylesheet" href="css/meb_haber_slider1.css" >
```

Figure 6: Example of the violation of checkpoint 4.3 by the Ministry of Education in Turkey

The checkpoint violated by large number of countries is Checkpoint 1.1 (Provide a text equivalent for every non-text element). This checkpoint was violated by 49

countries from all four groups of countries. The correction of this checkpoint is shown in Figure 7 [40]. An example of the violation of this checkpoint is shown in Figure 8 taken from the Ministry of Education in Egypt.

```
<A HREF="home.htm">
<IMG SRC="home.gif" ALT="Link to the Home page.">
</A>
```

Figure 7: Correction of Checkpoint 1.1 to provide a text for each non -text element

```
                    </div>
                    <div class="search border-right">
                        <a href="http://portal.moe.gov.eg/Citizens/Pages/TechnicalSupport.aspx"
target="_blank">
                            <img src="/eng/_catalogs/masterpage/images/contacts.png" alt="" name="" />
                        </a>
                    </div>

                    <!-- end .header -->
                </div>
                <div class="line-top">
                </div>
                <div id="content-outer">
                    <div class="fltlft">
                        <div class="news-tile01 blue-light03 txt-white">
                            <div class="tile-group" style="background-color:transparent">
                                <div id="News-tile-Dynamic" data-mode="carousel" data-start-now="true"
class="live-tile" data-direction="vertical" data-delay="4500" style="width: 100%; height: 130px;">
                                </div>
                            </div>
```

Figure 8: An example of the violation of checkpoint 1.1 taken from the Ministry of Education in Egypt

The next checkpoint violated by 28 countries is Checkpoint 10.1 (Until user agents). The explanation of this checkpoint is shown in Figure 9 [42]. The violation for this checkpoint is shown in Figure 10 taken from Ministry of Education in Lesotho.

```
<A HREF="new-page.htm" TARGET="_blank">The Wonderful World of Sponge</A>
```

Figure 9: Explanation of Checkpoint 10.1 (Open New Window in Your Browser)

```
    <title>Home - Ministry Of Education And Training</title>
    <link href="/index.php?format=feed&amp;type=rss" rel="alternate" type="application/rss+xml" title="RSS 2.0" />
    <link href="/index.php?format=feed&amp;type=atom" rel="alternate" type="application/atom+xml" title="Atom 1.0" />
    <link href="/templates/it_blackwhite2/favicon.ico" rel="shortcut icon" type="image/vnd.microsoft.icon" />
    <link href="http://www.education.org.ls/index.php/component/search/?
layout=blog&amp;id=10&amp;Itemid=101&amp;format=opensearch" rel="search" title="Search Ministry Of Education And
Training" type="application/opensearchdescription+xml" />
    <link href="/plugins/system/iceshortcodes/assets/iceshortcodes.css" rel="stylesheet" type="text/css" />
    <link href="/plugins/system/iceshortcodes/assets/bootstrap/css/bootstrap.min.css" rel="stylesheet" type="text/css"
/>
    <link href="/plugins/system/iceshortcodes/assets/bootstrap/css/bootstrap-responsive.min.css" rel="stylesheet"
type="text/css" />
    <link href="/modules/mod_ice_carousel/assets/flexslider.css" rel="stylesheet" type="text/css" />
    <link href="/modules/mod_ice_carousel/assets/style.css" rel="stylesheet" type="text/css" />
    <link href="/media/system/css/modal.css" rel="stylesheet" type="text/css" />
    <link href="/modules/mod_slideshowck/themes/default/css/camera.css" rel="stylesheet" type="text/css" />
    <link href="https://fonts.googleapis.com/css?family=Droid+Sans" rel="stylesheet" type="text/css" />
    <link href="http://www.education.org.ls/modules/mod_icemegamenu/themes/default/css/default_icemegamenu.css"
rel="stylesheet" type="text/css" />
    <link href="http://www.education.org.ls/modules/mod_icemegamenu/themes/default/css/default_icemegamenu-
reponsive.css" rel="stylesheet" type="text/css" />
```

Figure 10: Explanation of the violation of Checkpoint 10.1 taken from the Ministry of Education in Lesotho

The fourth checkpoint violated by 28 countries is Checkpoint 12.4 (Associate labels explicitly with their controls). The explanation of this checkpoint is shown in Figure 11 [43]. An example of the violation of this checkpoint by Kazakhstan is shown in Figure 12.

```
<FIELDSET>

    <LEGEND align="top">
      Options Required
    </LEGEND><BR>

    <INPUT TYPE="CHECKBOX"
      NAME="opt1" ID="opt1" VALUE="abs"><BR>
    <LABEL for="opt1">>Anti-lock breaks</LABEL>

    <LABEL for="opt2">Moon roof </LABEL>
    <INPUT TYPE="CHECKBOX"
      NAME="opt2" ID="opt2" VALUE="mr"><BR>
    <INPUT TYPE="CHECKBOX"
      NAME="opt3" ID="opt3" VALUE="hm">
    <LABEL for="opt3">Heated mirrors</LABEL>

    <LABEL for="opt4">Power windows</LABEL><BR>
    <INPUT TYPE="CHECKBOX"
      NAME="opt4" ID="opt4" VALUE="pw">

</FIELDSET>
```

Figure 11: Checkpoint 12.4 (Associate label with their controls)

```
    <link rel="apple-touch-icon" sizes="57x57" href="/bitrix/templates/economy_en/images/ico/apple-icon-57x57.png">
    <link rel="apple-touch-icon" sizes="60x60" href="/bitrix/templates/economy_en/images/ico/apple-icon-60x60.png">
    <link rel="apple-touch-icon" sizes="72x72" href="/bitrix/templates/economy_en/images/ico/apple-icon-72x72.png">
    <link rel="apple-touch-icon" sizes="76x76" href="/bitrix/templates/economy_en/images/ico/apple-icon-76x76.png">
    <link rel="apple-touch-icon" sizes="114x114" href="/bitrix/templates/economy_en/images/ico/apple-icon-114x114.png">
    <link rel="apple-touch-icon" sizes="120x120" href="/bitrix/templates/economy_en/images/ico/apple-icon-120x120.png">
    <link rel="apple-touch-icon" sizes="144x144" href="/bitrix/templates/economy_en/images/ico/apple-icon-144x144.png">
    <link rel="apple-touch-icon" sizes="152x152" href="/bitrix/templates/economy_en/images/ico/apple-icon-152x152.png">
    <link rel="apple-touch-icon" sizes="180x180" href="/bitrix/templates/economy_en/images/ico/apple-icon-180x180.png">
    <link rel="icon" type="image/png" sizes="192x192" href="/bitrix/templates/economy_en/images/ico/android-icon-192x192.png">
```


Figure 12: Violation of Checkpoint 12.4 by the Ministry of Education in Kazakhstan

The final high checkpoint violated by 26 countries is Checkpoint 6.4 (For scripts and applets, ensure that event handlers are input device-independent). The explanation and correction of this checkpoint are shown in Figure 13 [44]. Figure 14 explains the violation of this checkpoint by the Ministry of Education in South Africa.

Here is the code used to create the scripted button:

```
<BUTTON ONMOUSEOVER="pop()">
Win a prize!</BUTTON>.
```

And the code of the script function itself:

```
<SCRIPT language="JavaScript" type="text/javascript">
function pop() { alert ("You Win First Prize!") }
</SCRIPT>
<NOSCRIPT>You Win First Prize!</NOSCRIPT>
```

Figure 13: Explanation of Checkpoint 6.4 (Provide event handlers for each input button)

```
        </td>

        <td align="right" width="100%" class="buttonheading">
    <a href="/index.php?view=article&amp;catid=1:local-news&amp;id=26636:prime-minister-of-ethiopia-dr-abiy-ahmed-
arrives-in-asmara&amp;format=pdf" title="PDF"
onclick="window.open(this.href,'win2','status=no,toolbar=no,scrollbars=yes,titlebar=no,menubar=no,resizable=yes,width=64
0,height=480,directories=no,location=no'); return false;" rel="nofollow"><img
src="/templates/jaw050/images/pdf_button.png" alt="PDF"  /></a> </td>

        <td align="right" width="100%" class="buttonheading">
    <a href="/index.php?view=article&amp;catid=1:local-news&amp;id=26636:prime-minister-of-ethiopia-dr-abiy-ahmed-
arrives-in-asmara&amp;tmpl=component&amp;print=1&amp;layout=default&amp;page=" title="Print"
onclick="window.open(this.href,'win2','status=no,toolbar=no,scrollbars=yes,titlebar=no,menubar=no,resizable=yes,width=64
0,height=480,directories=no,location=no'); return false;" rel="nofollow"><img
src="/templates/jaw050/images/printButton.png" alt="Print"  /></a>  </td>

        <td align="right" width="100%" class="buttonheading">
    <a href="/component/mailto/?tmpl=component&amp;link=d8d9f80eb09642aaee6965bf604b5a42fdc1c296" title="E-mail"
onclick="window.open(this.href,'win2','width=400,height=350,menubar=yes,resizable=yes'); return false;"><img
src="/templates/jaw050/images/emailButton.png" alt="E-mail"  /></a> </td>
        </tr>
</table>
<table class="contentpaneopen">
```

Figure 14: Example to a violation of Checkpoint 4.6 by the Ministry of Education in South Africa

The above explanation is the highest of five checkpoints which was violated by the largest number of countries. Now, we explain the five lowest checkpoints violated by the lowest number of countries. The first of the lowest checkpoints violated by only one country is Checkpoints 12.3 (Divide large blocks of information into more manageable groups where natural and appropriate). An example of this explanation is shown in Figure 15 [45]. Figure 16 explains an example of the violation of this checkpoint by the Ministry of education in Kyrgyzstan.

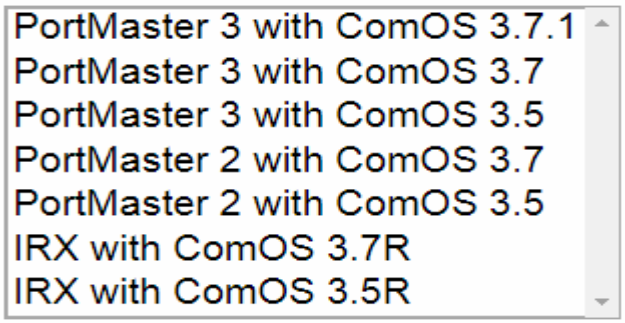

Figure 15: Explanation of organizing blocks as mentioned by Checkpoint 12.3

```
    <div class="row">
        <div class="info_block">
            <h2 class="mgl15 brh2">Общая информация</h2>

            <div class="col-md-8 pdt15">
                <div class="info_left">
                    <p class="info_block_text">Министерство образования и науки Кыргызской Республики (МОиН
КР) - орган государственной политики и нормативно-правовому регулированию в сфере образования, научной,
научно-технической и инновационной деятельности, интеллектуальной собственности, а также в сфере воспитания,
социальной поддержки и социальной защиты обучающихся и воспитанников образовательных учреждений.</p>
                    <a href="/ru/about/" class="read_more">Подробнее о Министерстве образования и науки КР</a>
                </div>
            </div>
            <div class="col-md-4 pdt15">



            </div>
        </div>
    </div>
```


Figure 16: Violation of Checkpoint 12.3 by Kyrgyzstan

The next violation is of 13.4 (Use navigation mechanisms in a consistent manner), where the reliable style of appearance on each side allows users to easily find navigation buttons between pages. Moreover, the user can find the main contented for each page. Whereas this aids make it easier for everybody, it particularly paybacks people with reading and learning problems. Facilitation of the prediction of desirable information initiate on each page will rise the probability that it will be found. All of slide sets share a communal style, with the whole layout of navigation and contented components being related. The explanation of the violation of this checkpoint by the Ministry of Education in Indonesia is shown in Figure 17.

```
<?xml version="1.0" encoding="utf-8"?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html xmlns="http://www.w3.org/1999/xhtml" xml:lang="en" lang="en">
<head>
  <script type="text/javascript" src="/templates/asef/js/jquery.js"></script>
    <base href="http://www.asef.org/about/partners/partner/3945-ministry-of-education-
and-culture,-indonesia" />
  <meta http-equiv="content-type" content="text/html; charset=utf-8" />
  <meta name="generator" content="Joomla! - Open Source Content Management" />
  <title>Asia-Europe Foundation (ASEF) - Ministry of Education and Culture,
Indonesia</title>
  <link href="/favicon.ico" rel="shortcut icon" type="image/vnd.microsoft.icon" />
  <script type='text/javascript'>
```

Figure 17: Violation of Checkpoint 13.4 by the Indonesian Ministry of Education

The next checkpoint is 1.3 (Until user agents). This description is used for the visual path of multimedia in order to send important information such as actions, graphs and charts. This will be stopped if the user is not able to see the screen such as the case for blind people. These descriptions are considered necessary if the user wants to

understand the presentation of the page through video. It must be mentioned that the above checkpoint was also violated by only one country.

```
    <script src="//code.jquery.com/jquery-1.11.3.min.js"></script>
    <script src="/bitrix/templates/economy_kz/jquery/jquery.jshowoff.min.js"></script>
    <link rel="stylesheet" href="/bitrix/templates/economy_kz/fonts.css" type="text/css"/>
    <link rel="stylesheet" href="/bitrix/templates/economy_kz/font-awesome-4.2.0/css/font-awesome.min.css" />

    <link rel="apple-touch-icon" sizes="57x57" href="/bitrix/templates/economy_kz/images/ico/apple-icon-57x57.png">
    <link rel="apple-touch-icon" sizes="60x60" href="/bitrix/templates/economy_kz/images/ico/apple-icon-60x60.png">
    <link rel="apple-touch-icon" sizes="72x72" href="/bitrix/templates/economy_kz/images/ico/apple-icon-72x72.png">
    <link rel="apple-touch-icon" sizes="76x76" href="/bitrix/templates/economy_kz/images/ico/apple-icon-76x76.png">
    <link rel="apple-touch-icon" sizes="114x114" href="/bitrix/templates/economy_kz/images/ico/apple-icon-114x114.png">
    <link rel="apple-touch-icon" sizes="120x120" href="/bitrix/templates/economy_kz/images/ico/apple-icon-120x120.png">
    <link rel="apple-touch-icon" sizes="144x144" href="/bitrix/templates/economy_kz/images/ico/apple-icon-144x144.png">
    <link rel="apple-touch-icon" sizes="152x152" href="/bitrix/templates/economy_kz/images/ico/apple-icon-152x152.png">
    <link rel="apple-touch-icon" sizes="180x180" href="/bitrix/templates/economy_kz/images/ico/apple-icon-180x180.png">
    <link rel="icon" type="image/png" sizes="192x192"  href="/bitrix/templates/economy_kz/images/ico/android-icon-
192x192.png">
    <link rel="icon" type="image/png" sizes="32x32" href="/bitrix/templates/economy_kz/images/ico/favicon-32x32.png">
    <link rel="icon" type="image/png" sizes="96x96" href="/bitrix/templates/economy_kz/images/ico/favicon-96x96.png">
    <link rel="icon" type="image/png" sizes="16x16" href="/bitrix/templates/economy_kz/images/ico/favicon-16x16.png">
    <link rel="manifest" href="/bitrix/templates/economy_kz/images/ico/manifest.json">
    <meta name="msapplication-TileColor" content="#ffffff">
    <meta name="msapplication-TileImage" content="/bitrix/templates/economy_kz/images/ico/ms-icon-144x144.png">
    <meta name="theme-color" content="transparent">
```


Figure 18: Violation of Checkpoint 1.3 by the Ministry of Education in Kazakhstan

The other three checkpoints violated by only two countries are Checkpoints 5.4 (If a table is used for layout, do not use any structural markup for the purpose of visual formatting). The explanation of this checkpoint and how it can be modified is shown in Figure 19 [46].

For example, use:

```
<TD><DIV style="font-weight: bold">Give me bolded text</DIV></TD>
```

rather than:

```
<TH>Give me bolded text<TH>
```

Figure 19: Explanation of the correct use of HTML markup in order to achieve the correction of Checkpoint 5.4

```
<center>
    <table>
        <tr>
            <td colspan="2" style="text-align: right; padding-right: 13px; height: 28px; width: 1200px;">

                <a id="ctl00_lnk_giris_cikis" class="giris"
href="javascript:__doPostBack('ctl00$lnk_giris_cikis','')" style="display:inline-block;font-weight:bold;width:60px;text-
align: center;">Giriş</a>
            </td>
        </tr>
        <tr>
            <td>
                <center>
```


Figure 20: Violation of Checkpoint 5.4 by the Turkish Ministry of Education

The next checkpoint also violated by only two countries is Checkpoint 10.4 (Until user agents handle empty controls correctly, include default, place-holding characters in edit boxes and text areas). The explanation and correction of this checkpoint is shown in Figure 21 [47].

```
Your name <INPUT TYPE="TEXT" NAME="Name" SIZE="50" VALUE="* ">
   Feedback <TEXTAREA NAME="TextArea1" ROWS="4" COLS="50">
     Please enter your comments here: </TEXTAREA>
<INPUT TYPE="submit" VALUE="Submit this form.">
```

Figure 21: Explanation and correction for Checkpoint 10.4

```
            <img src=""
                 data-src="http://edu.gov.az/subscribe/captcha"
                 id="subscribe_captcha"/>
            <input type="text"
                   placeholder="Enter code"
                   name="subscribe_captcha_input" class="standard_text_input"
                   id="subscriber_captcha"/>
        <p>
            <input type="button" id="apply_subscribe" class="btn"
                   value="Send"/>
    </div>
    <input type="submit" value="Send" id="subscribe">
</form>
```

Figure 22: Explanation of the violation of Checkpoint 10.4 by Azerbaijan

The final checkpoint violated by only two countries is Checkpoint 13.1 (Clearly identify the target of each link) [48].

```
<A href="next.htm" title="All about income tax. ">Go to the next page.</A>
```

Figure 23: Explanation and correction of Checkpoint 13.1

```
<div class="col-xs-12 col-sm-6 col-md-6">
    <div id="carousel-example-generic3" class="carousel slide addmargin3" data-ride="carousel">



        <!-- Indicators -->
        <ol class="carousel-indicators">

        </ol>
        <!-- Wrapper for slides -->
        <div class="carousel-inner" role="listbox">
            <div class="item active">
                <a href="http://www.moe.gov.bh/customerservicecenter.aspx"  target="_blank">
                    <img src="http://www.moe.gov.bh/images/advert/customer-services-en.jpg" /></a>

            </div>
        </div>
    </div>
</div>
```


Figure 24: Explanation of the violation of Checkpoint 13.1 by the Ministry of Education in Bahrain

The results indicate the necessity of giving these checkpoints higher importance and working on designing and developing tools and keywords designed specially in order to overcome these checkpoints to guarantee overcoming these checkpoint violations and to give the user greater flexibility while using these websites.

CHAPTER 6

CONCLUSION

A basic and initial note about studying the accessibility and usability is that we have clearly become supporters of web accessibility and usability due not necessarily to high personal experiences or points of view about the topic when we first started the study. The explanation of the study to other persons nevertheless has increased its influence on the subject of study. This result is very good because the most significant result of this work is to create consciousness of this subject at different levels and specialist users. Moreover, the concept of awareness has been mentioned in many studies and has been clarified in this study, focusing on the importance and benefits of accessibility. It is possible that web accessibility and usability may be taken into consideration where companies and people know what accessibility and usability exactly means in practice. Thus, the most significant goals of this study were the creation of an image about the meaning of accessibility and usability in the web and gaining experience in practice.

The current study addressed accessibility and usability for education ministries in most countries in the world. Those countries were classified into four groups according to the level of income of each country, these levels being low-income, lower-middle income, upper-middle income and high-income. The results obtained and the violations registered these websites may alert web developers to take serious steps and focus on accessibility and usability in order to serve all pioneers of a website, especially those people with different disabilities. The standards by which we measured the violations was according to WCAG 1.0 and the checkpoints included in this software are mentioned and described in detail in previous parts of this study. Therefore, web developers and designers must seriously make efforts and conduct studies on this issue in order to find solutions that satisfy all people who can then

access websites characterized by simplicity and usability and can be used by most levels of society."Finally, the analysis results revealed that most of the countries have violated the checkpoints despite of their level of income and their development. We have only two countries which have not been violated any checkpoints in their analysis which are Brazil and Canada as discovered during our analysis. The most violated checkpoints are 4.3 Identify the primary natural language of a document, 1.1 Provide a text equivalent for every non-text element, 5.5 Provide summaries for tables and 10.1 Until user agents".

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